



**CALIFORNIA High-Speed Rail Authority**



## **2020 BUSINESS PLAN**



***Recovery and Transformation***





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## FROM THE CEO

**“It Always Seems Impossible Until it is Done.”**

– Nelson Mandela

On February 12, 2020, the California High-Speed Rail Authority (Authority) issued its Draft 2020 Business Plan for public review. Shortly thereafter, the world changed. This 2020 Business Plan must be looked at through the lens of the past year. It's been a year of:

- Unprecedented challenges;
- Adverse impacts—some temporary, some lasting; and
- Record-level progress in spite of the challenges.

And, as we look forward, there is new opportunity to build on that progress and significantly advance the program. This 2020 Business Plan lays out that path forward.

Just a month after our draft was released, the World Health Organization declared the coronavirus

outbreak a pandemic and subsequently, on March 19th, Governor Newsom issued a stay-at-home order to protect the health and well-being of all Californians and slow the spread of COVID-19. Almost a year later, the dramatic impacts of the pandemic continue to affect all we do.

I opened my CEO letter in the Draft 2020 Business Plan by stating, “Nothing worth doing is easy.” In these last few months, that statement has taken on a whole new meaning. At the same time, I emphasized that delivering California high-speed rail is worth doing to expand California's economic prosperity, improve mobility and combat the effects of climate change. That is still true.

### **The Authority Adapted Quickly to the Pandemic**

Putting the health and safety of the public and our employees and contractors as the highest priority, we adapted quickly to address the immediate circumstances associated with the pandemic. Within 10 days, more than 90 percent of our administrative organization was effectively teleworking. In March, we shifted our public meetings to a virtual format and in April, our Board of Directors held its first online meeting.

At our construction sites, we worked closely with our contractors and labor groups to implement safety standards to protect essential workers while they advanced the construction work. We reduced in-person business meetings and travel. In short, we adjusted how we do business to ensure our business gets done.

However, COVID-19 has impacted our program. The High-Speed Rail Authority has not been spared nor is it alone in being impacted by COVID-19. Although we are not yet an operating passenger service, the pandemic has affected virtually every aspect of our organization and program:



- We deferred the adoption of our 2020 Business Plan by nearly a year to provide more time to assess risks, conduct further project reviews, provide more opportunity for public comment on our work, and to accommodate necessary legislative oversight;
- We have quarantined nearly 250 workers, adversely affecting our construction progress;
- The Cap-and-Trade revenues available to this project were reduced by \$288 million (recovery of these revenues is expected from future Cap-and-Trade auctions);
- Our procurement process for the Track and Systems contract has been delayed by several months (contract scope is anticipated to change, as noted in this 2020 Business Plan);
- We granted requests from local communities and other stakeholders to extend the public comment periods for our environmental reviews to allow more time for agencies and jurisdictions to prepare comments;
- Many California courts either closed or severely reduced their hours, which delayed filings and court dates, slowing our right-of-way acquisition schedule as a result; and
- The uncertainty surrounding the depth and duration of this pandemic will continue to present us with numerous risks to be recognized, managed and mitigated.

These impacts have affected both our schedules and costs. We will need more time to complete all the work for each of the three construction packages in the Central Valley. We anticipate reaching substantial completion on the first 22-mile segment (Construction Package 4) in about 15 months; the other two construction packages (Construction Package 1 and Construction Package 2-3) will take us into 2023. Our costs for these construction packages are up by about \$330 million over our current budget and, because

of the risk and uncertainty that lays ahead, we propose to increase our contingency budget considerably. Moreover, to mitigate risks affecting our Track and Systems procurement, we propose to change the timing, approach to construction and phasing of the track installation. These actions will mitigate cost risks and improve construction efficiency.

We have commenced conversations with the Biden Administration on these matters. Because the project is advancing, as noted below, we believe we can work with our federal partner on our revised schedule and restore federal investment in this program.

The pandemic has challenged and humbled us, but it has not defeated us, nor has it diverted us from our mission. By virtue of preparation, hard work, agility and blessing, the Authority has expanded the number of construction sites open and has increased the number of workers dispatched to those job sites throughout the pandemic. As the work continues to advance, we will create more well-paying jobs and more economic opportunity for Californians and small and disadvantaged businesses.

### **Advancing the Work Through Unprecedented Challenges**

Despite COVID-19 and with no engagement from the federal government, the Authority made major advances, as shown in **Exhibit 0.0**:

- In November 2020, we hit an all-time high of 1,208 daily workers dispatched to 35 open job sites in the Central Valley, almost doubling the number of workers dispatched at the start of the pandemic;
- Since 2018, we have doubled the total number of construction jobs created by the project, from roughly 2,600 to more than 5,200;



**Exhibit 0.0: Where We Are Today**

- In that same period, we have nearly tripled the number of structures that are either under construction or completed, and we have increased the miles of guideway cleared for construction by 60 percent;
- We dedicated \$423 million in Proposition 1A bond funds to the reconstruction of the Los Angeles Union Station, helping to transform it into a world-class multimodal hub; and
- We environmentally cleared two segments in the Central Valley (all of Merced to Bakersfield) and issued environmental drafts on four more segments in the Bay Area and Southern California, covering more than 420 miles of the San Francisco to Los Angeles/Anaheim system.

Imagine what we could have accomplished if we had not been faced with a pandemic. That said, I am extraordinarily proud of the team's ability to adjust and advance the project, remain productive and keep Californians working.

### **What's to Come in 2021**

These broad areas of progress will culminate in very significant milestones and actions by the Authority over the next 12 to 15 months. While the challenges of the first construction packages have been fully documented and discussed, our work on this program now reflects a turning of the tide away from yesterday's challenges and toward tomorrow's opportunities.

We completed 100 percent of the required state match for \$2.5 billion in federal American Recovery and Reinvestment Act (ARRA) funds in the first quarter of 2021 (22 months ahead of deadline). Other upcoming important milestones include:

1. Substantial completion of the first construction package in the Central Valley (Construction Package 4), a 22-mile stretch through Kern County to Poplar Avenue;

2. Environmental clearance of our first two segments into Los Angeles County with the Record of Decision (ROD) for Bakersfield to Palmdale planned in the second quarter of 2021 and for Burbank to Los Angeles in the fourth quarter of 2021;
3. Award of the Track and Systems contract in 2021 with work commencing in 2022;
4. Commencement of advanced design work, right-of-way mapping, and identification of utility relocation work needed for the Bakersfield and Merced extensions; and
5. Construction completed or underway on 83 of 93 structures and on 106 of 119 miles of guideway by the end of 2021.

### **Improving Risk Management**

More than anything, the pandemic has reconfirmed the importance of recognizing, managing and mitigating risk. This plan reflects our understanding of this reality. To better manage risk, as we describe in Chapter 6, we are taking three specific steps:

1. Increasing our risk contingency in our Program Baseline budget;
2. Establishing an Enterprise Risk Management program at the Authority, including the creation of a risk committee and strengthening our expertise in risk analysis under the direction of a newly appointed Director of Risk Management and Project Controls; and
3. Implementing a Stage Gate project development and delivery program to bring more structure and rigor as projects advance through planning, design and into construction; this approach will help us better understand, manage and mitigate risks before starting future construction contracts.



These steps reflect greater organizational maturity, our commitment to apply lessons learned from the program's nascent beginnings at the very start of the Central Valley construction and an approach to future decision-making grounded in a comprehensive risk framework.

### **Road Map Ahead**

In our Draft 2020 Business Plan released in February 2020, we described how we would advance the project from the first 119-mile construction segment in the orchards of the Central Valley to a 171-mile operating line between the cities of Merced and Bakersfield. Legislators and the California High-Speed Rail Peer Review Group asked that we look more closely at this approach, re-evaluate the ridership forecasts and take actions to mitigate risks.

We have done that and have reaffirmed that an interim operating segment between Merced and Bakersfield, as the first building block for delivering high-speed rail passenger service in California, is appropriate. While we develop that segment, we will also advance design work statewide to prepare to expand the system out of the Valley, northwest to the Bay Area and south to Los Angeles and Anaheim, as funding becomes available. To do this, we propose making additional investments statewide, as we articulate further in this plan.

### **The Vision Is More Important Now Than Ever**

Building the nation's first truly high-speed rail system linking the Bay Area to Los Angeles and Anaheim, including the communities in the Central Valley, is essential for California. Completing the work is in California's interest to maintain

its position as a global leader when it comes to economic prosperity and opportunity, job creation, combating climate change, and building world-class infrastructure.

Our job now is to advance the work we have started to keep Californians working, recover from the impacts of a global pandemic and progress this transformative project. We are turning the corner from the struggles of early construction and toward a more disciplined, methodical and steady way of doing business. We look forward to moving from the orchards to the cities of the Central Valley and then beyond, to the Bay Area and Southern California. We will work closely with the Biden Administration, Congress, the Legislature, and our statewide partners to make it happen. It will take time, perseverance, further investment, and vision.

And it will feel impossible—until it is done.

Brian P. Kelly  
Chief Executive Officer



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Rendering: High-speed rail station



# INVESTMENT IN CLEAN TRANSPORTATION

With the new year comes a renewed focus on building a resilient, sustainable economy and green transportation systems that support climate change policies and initiatives. The Biden Administration presents the opportunity to re-establish a collaborative federal partnership and to move California's transportation sector toward more environmentally friendly modes while also putting thousands of Californians back to work. Over the last decade, California's leaders have focused on policies and funding programs to advance clean transportation, spur job growth and improve air quality. The results of these efforts can clearly be seen on the largest, greenest infrastructure project in the country—California high-speed rail.

An investment in California high-speed rail is an investment in California's economy. To date, more than 5,000 good-paying construction jobs have been created for women and men working at 35 construction sites in the Central Valley. Seventy-seven percent of the people employed on the project live and work in the region. In addition to labor jobs created, more than 600 small businesses are working on the project. In mid-2020, in partnership with local labor, regional economic partners and city leaders, the Authority helped launch the Central Valley Training Center in Selma. The center provides training and job opportunities; the first cohort of students graduated in January 2021 and more than 500 people have applied for future training programs.

## CHAPTER 1

As funding becomes available for high-speed rail and the project continues to expand, these opportunities will continue to grow in both Northern and Southern California. Over the better part of the last decade, California's investments in transportation have sought to achieve three key objectives:

1. Expand economic development;
2. Meet the state's environmental objectives, particularly the reduction of greenhouse gas emissions; and
3. Improve mobility for our citizens.

No single project achieves so much toward meeting these objectives as California's high-speed rail project.

As the Biden Administration era begins, California's efforts to build transportation infrastructure that reduces greenhouse gas emissions and shifts passenger rail from fossil fuels to clean, renewable energy could not be better timed. President Biden has laid out an ambitious and bold transportation plan supporting transformative investments in regional and intercity passenger rail that will build a modern, sustainable infrastructure and create an equitable clean energy future.

## High-Speed Rail: An Economic Engine

Ever since the Great Depression, investment in transportation infrastructure has been key to stimulating economic recovery. During this time of economic uncertainty with the COVID-19 pandemic, it's evident that investment in good-paying transportation infrastructure jobs is once again needed to help combat growing unemployment. Since the beginning of the COVID-19 pandemic in March 2020, broad-based unemployment has increased in California by 3

percent. However, during that same period, high-speed rail construction in the Central Valley has continued to create jobs.

Throughout its development, the high-speed rail project has stimulated local and regional economies through significant investment in planning the system and building the first segment of high-speed rail. Between July 2006 and June 2020, the Authority has invested more than \$7.2 billion in planning and building high-speed rail infrastructure. As shown in [Exhibit 1.0](#), this investment rippled through California's economy.

**Exhibit 1.0:** Economic Impact of High-Speed Rail Investments (July 2006 to June 2020)



**JOB-YEARS OF  
EMPLOYMENT**  
**54,300 - 60,400**



**LABOR  
INCOME**  
**\$3.9B - \$4.4B**



**ECONOMIC  
OUTPUT**  
**\$10.5B - \$11.4B**



**Photo:** Nighttime girder at the Cedar Viaduct



## HIGH-SPEED RAIL HELPED CALIFORNIA RECOVER FROM THE GREAT RECESSION — NOW ON TO COVID RECOVERY

As we find ourselves facing unemployment and other economic challenges related to COVID-19, it's worth noting that California high-speed rail helped put people and small businesses to work and helped the state recover from the recession of 2008.

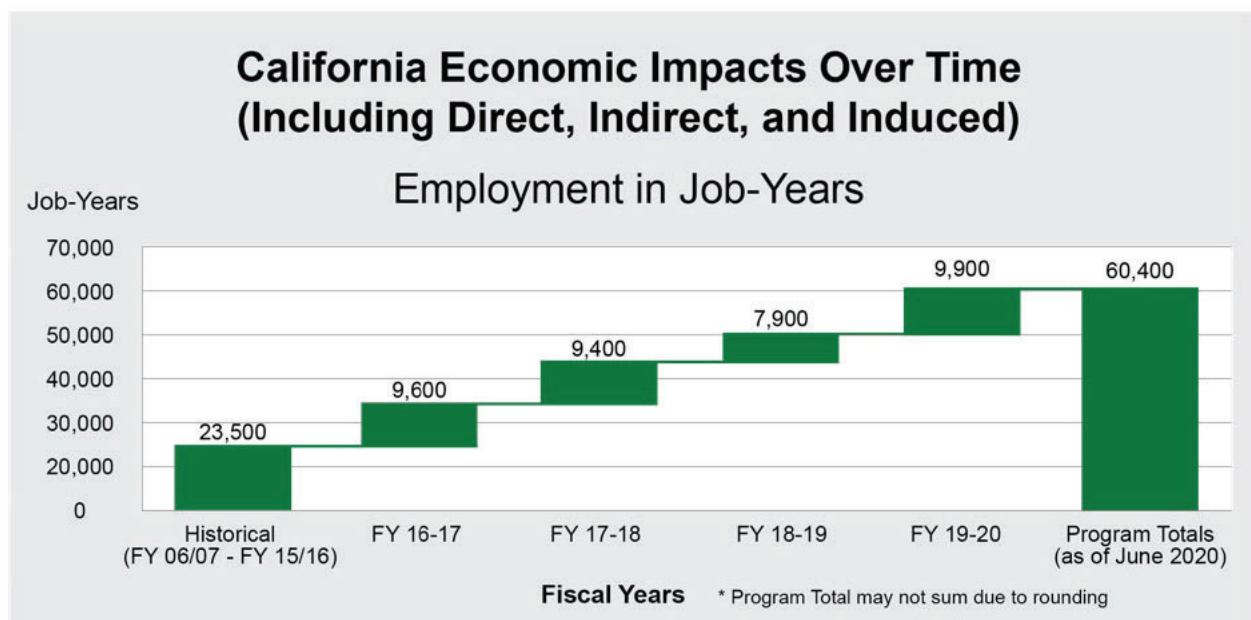
The Great Recession profoundly affected California, with unemployment reaching a rate of 12.5 percent in 2009. To address the economic crisis, the president and Congress passed the American Recovery and Reinvestment Act of 2009 (ARRA). ARRA funds were allocated to state and local governments to provide economic stimulus to save and create jobs through infrastructure investment.

California received \$2.55 billion in ARRA funds and matched them with state Proposition 1A and Cap-and-Trade funds to begin building high-speed rail in the Central Valley and environmentally clear the full 500-mile system.

With these funds, California helped achieve ARRA's policy goals by creating thousands of good-paying jobs that helped put people back to work, as shown in [Exhibit 1.1](#). By December 2020, the Authority surpassed 5,000 construction workers dispatched since the start of construction, with 77 percent of the workers living in the Central Valley.

Continuing our investment in California high-speed rail will help California—and the nation—recover from the current economic crisis by putting even more people back to work and creating even broader opportunities for small and disadvantaged businesses to participate and prosper, while building the most transformative project in the nation.

**Exhibit 1.1:** Job-Years Generated by High-Speed Rail (Through June 30, 2020)



## A MEGAPROJECT WITH A WIDE ECONOMIC REACH

Although active construction is focused in the Central Valley through three construction packages, the sheer scale of the project spreads benefits across the state and the nation. As of June 2020, the California High-Speed Rail Program has invested \$195.6 million outside California. Companies from 42 states, plus Washington D.C., have worked on the program—contributing, planning, engineering, financial and other services.

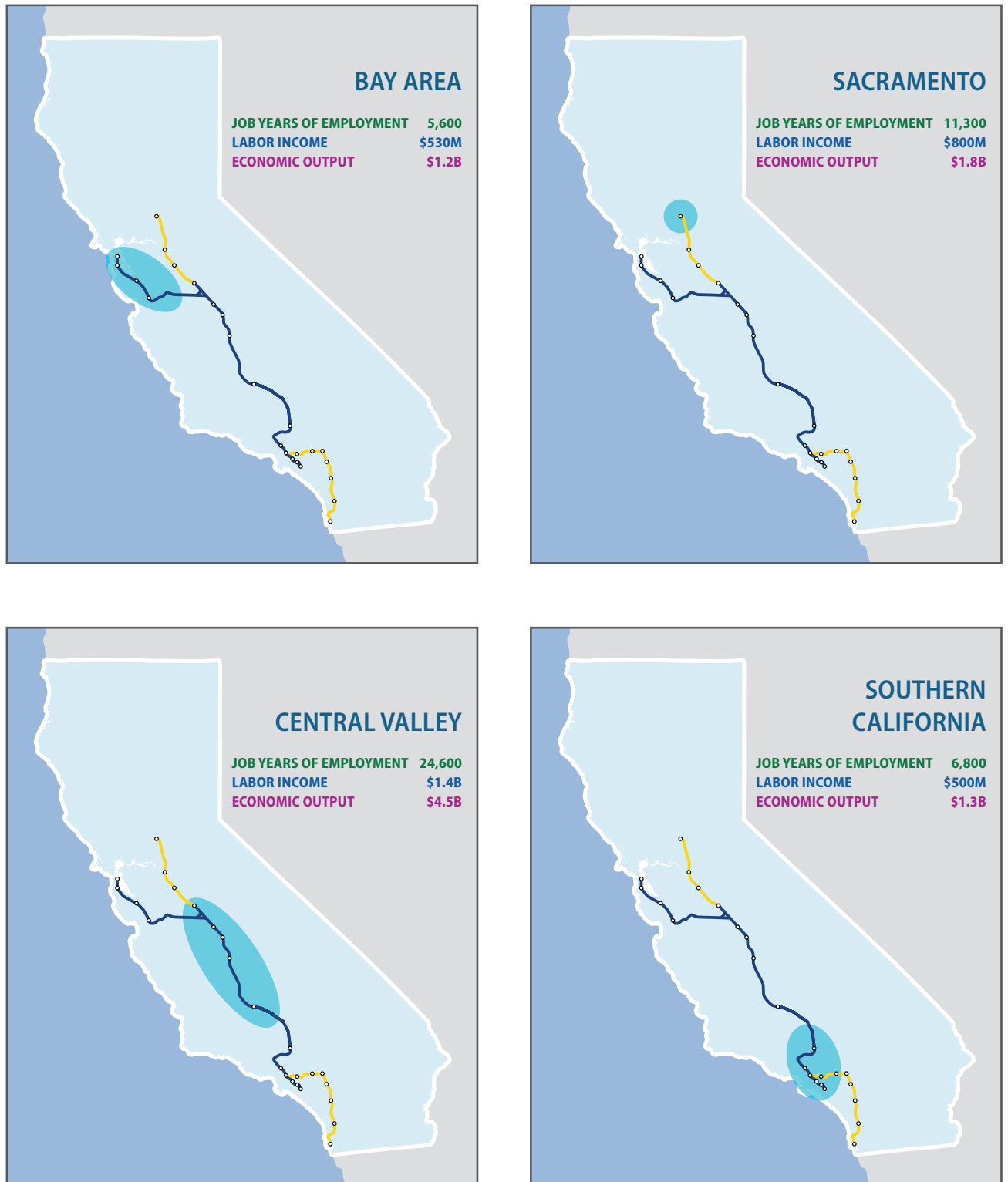
**“This is a truly visionary project that will catapult America into the 21st century with fast, efficient transportation. The entire nation stands to benefit from high speed rail with millions of jobs, new opportunities, and vast new access to affordable housing – all on clean, green high-speed rail”**

*Andy Kunz  
President & CEO  
US High Speed Rail Association*

Closer to home **Exhibit 1.2** shows the economic benefits, jobs and business opportunities those investments have had on the state’s largest regions. In the future, these benefits will grow with continued design and buildout of the full system. As we contract with new companies and those firms hire new workers, the high-speed rail project will continue to provide stable jobs, broader economic benefits and help stimulate a new high-speed rail industry in California.

Our forecasts show that continued investment will provide significant economic benefits to the state. For example:

- The Silicon Valley to Central Valley Line is projected to create about 220,000 job-years of employment, \$17 billion in labor income and nearly \$50 billion in economic output; and
- The Phase 1 System is projected to create 624,000 job-years of employment, \$46 billion in labor income and nearly \$131 billion in economic output.

**Exhibit 1.2:** Economic Impacts by Region (Program Totals From July 2006 Through June 2020)



## CREATING OPPORTUNITY BY BUILDING TECHNICAL SKILLS AND EXPERIENCE

The Authority has worked alongside numerous organizations in communities throughout California to help train future workers, some of whom are now employed by contractors on the program. Under our Community Benefits Policy, programs have been implemented that promote and advance construction employment and training opportunities.

### ■ COMMUNITY BENEFITS AGREEMENT

Our Community Benefits Agreement (CBA) is a cooperative partnership between the Authority, skilled craft unions and contractors, and is designed to advance and promote training opportunities for all individuals. Through this agreement, we focus on engaging disadvantaged communities to provide employment opportunities for individuals who reside in disadvantaged areas and those designated as “Disadvantaged Workers,” including veterans. The job training that people receive enables workers to be employed not only on high-speed rail but on other future construction projects as well, delivering a lifetime of benefits.

The CBA’s Targeted Worker Program ensures that 30 percent of all project work hours are performed by “National Targeted Workers” and that at least 10 percent of those work hours are performed by “Disadvantaged Workers.” For more information on Targeted Workers and Disadvantaged Workers, see our Community Benefits Factsheet at [https://hsr.ca.gov/docs/communication/info\\_center/factsheets/CBA\\_Factsheet.pdf](https://hsr.ca.gov/docs/communication/info_center/factsheets/CBA_Factsheet.pdf)

This program ensures that funding is invested in disadvantaged communities in California, which

supports state Cap-and-Trade goals that funds are used to improve public health, quality of life and economic opportunity in communities that experience social, environmental and economic hardships.

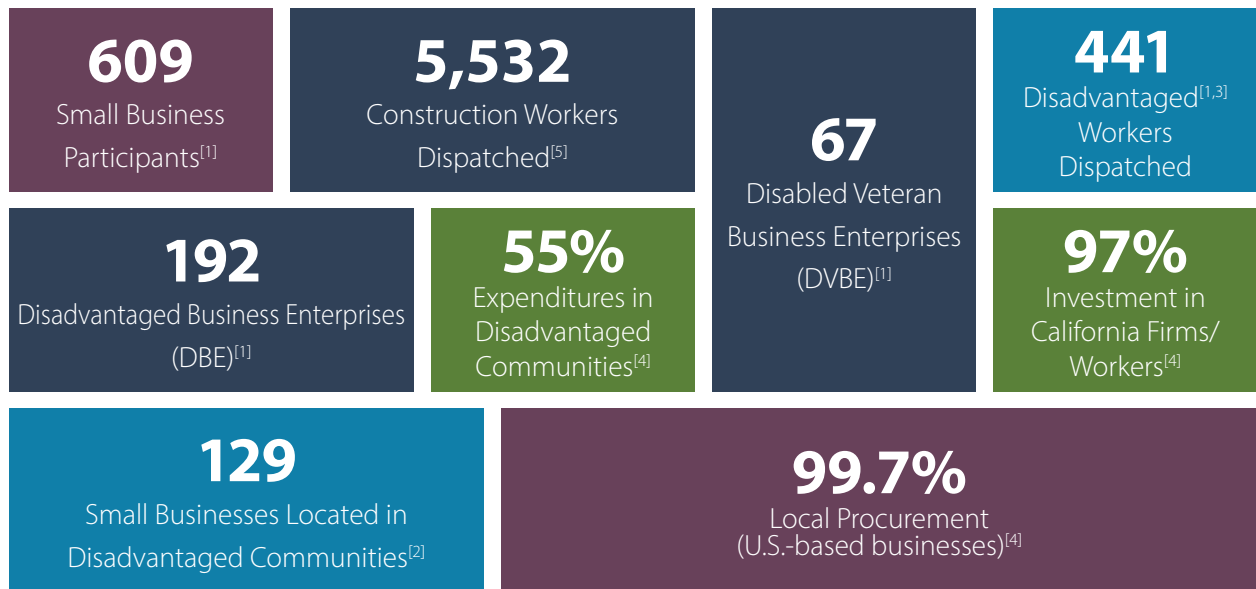
### ■ SMALL BUSINESS PROGRAM

We also remain committed to small businesses playing a major role in building the statewide high-speed rail project. Our Small Business Program has an aggressive, overarching goal for 30 percent small business participation in the project. This includes meeting the federal requirement of 10 percent for Disadvantaged Business Enterprises (DBE) participation and the California requirement of three percent for Disabled Veteran Business Enterprises (DVBE) participation.

For more information, visit the Authority’s Small Business dashboard at <https://hsr.ca.gov/small-business/>.

The Small Business Program requires the design-build and consultant teams to develop and implement a small business performance plan to achieve the 30 percent overarching goal. The Small Business Team has implemented targeted workshops to allow businesses to connect with Authority staff and to engage directly with leadership. The workshops help businesses gain a better understanding of our processes and aid in their success in participating on the project.

**Exhibit 1.3** shows how past investments have created opportunities for small businesses, disadvantaged businesses, disadvantaged workers and others in California. As of the end of 2020, 609 certified small businesses are working on the project statewide. This includes 192 certified Disadvantaged Business Enterprises and 67 Certified Disabled Veteran Business Enterprises.

**Exhibit 1.3:** Creating Opportunities for Disadvantaged Workers and Fostering Diversity

Notes: 1. Through December 31, 2020. 2. As defined by CalEnviroScreen. 3. As defined in Article 3.0 of the “General Management to Community Benefits Policy-National Targeted Hiring Initiative Plan” for the California High-Speed Rail Authority. 4. July 2006 to June 2020. 5. Through February 2021.



**Photo:** Construction at Garces Highway Viaduct

### Workforce Development Center Opens in Selma

In April 2020, the Authority partnered with the City of Selma to announce the creation of the Central Valley Training Center, a workforce development center to provide pre-apprenticeship classes and hands-on construction training for residents up and down the Central Valley who are looking for work on the nation's first high-speed rail project.

Although the center's opening was delayed by the COVID-19 pandemic, the center welcomed its first group of 30 students in October 2020, and the first cohort of students graduated in January 2021. In addition, 500 more people have already applied for future classes. The next group is scheduled to begin its 16-week training in February 2021.

In coordination with the Federal Railroad Administration, the Authority helped establish the Central Valley Training Center to address impacts to environmental justice populations and maximize high-speed rail employment opportunities. The center and its programs will serve veterans, at-risk young adults, and minority and low-income populations within Fresno, Kings, Tulare, Kern, Madera and Merced counties. The approach is modeled after the successful Cypress Mandela Center in Oakland, which trained community residents to work on the freeway replacement for the Cypress freeway damaged by the 1989 Loma Prieta earthquake. Similar programs are being discussed in other regions of the state.

*"The partnership the City and the Authority have developed to provide pre-apprenticeship training will give residents of Selma and the Central Valley the opportunity to enter into a career pathway that will afford a better quality of life for themselves and their families,"* said former Selma Mayor Louis Franco.





## Delivering on California's Climate Goals

Californians voted for high-speed rail as the means to achieve essential climate and economic-development goals, and we have honored that trust by working to create the greenest infrastructure project in the nation. California continues to focus on planning, design and construction practices that are already delivering measurable results across the delivery of the system and will continue to deliver results as we move into operations. For more information on the progress that we are making in fulfilling our commitments to sustainability, see our 2020 Sustainability Report at [https://hsr.ca.gov/docs/programs/green\\_practices/sustainability/Sustainability\\_Report\\_2020.pdf](https://hsr.ca.gov/docs/programs/green_practices/sustainability/Sustainability_Report_2020.pdf).

High-speed rail's zero-emission trains will be powered by 100-percent renewable energy. The stations and other high-speed rail related facilities we will build are being designed to be net-zero energy and energy net-positive, increasing environmental benefits and reinforcing California's commitment to renewable energy. We already require that our construction contractors use the cleanest equipment, resulting in our construction sites being 50 to 60 percent cleaner than typical California construction sites, with 97 percent of all construction waste recycled to date. We have preserved more than 3,750 acres for habitat restoration and conservation and planted more than 6,000 trees in the Central Valley and elsewhere in the state to balance out the remaining emissions produced through construction.

The 2018 California State Rail Plan creates a framework to provide the mobility that Californians will need in the future to protect the environment and to help invigorate California's cities. The State Rail Plan presents a vision for a modern, integrated

statewide passenger rail system connecting all urban, suburban and rural communities with frequent, reliable service.

California high-speed rail is the backbone of the State Rail Plan and is central to the state's climate policies. Electrified high-speed rail is key to transforming California's transportation system in an era where addressing climate change has become increasingly urgent. California is not just talking about the vision; we are building that system now, and California is leading the nation toward a faster, cleaner, more sustainable transportation future.

## NATIONAL RECOGNITION FOR SUSTAINABILITY

In December 2020, the Authority received national recognition for its sustainability efforts. The Envision Platinum rating was awarded by the Institute for Sustainable Infrastructure, a non-profit organization founded by the American Public Works Association, the American Society of Civil Engineers and the American Council of Engineering Companies. Envision Platinum is the highest award level possible, according to the Institute for Sustainable Infrastructure.

The California High-Speed Rail Program is the largest transportation infrastructure project both in terms of capital investment and geographic area to earn an Envision award for sustainable infrastructure to date. In comparison to other rail projects underway in 2020, only one other rail project in the world—the Frasso Telesino-San Lorenzo Maggiore Section of the Naples-Bari Railway Line in Italy—achieved a Platinum rating. The Platinum Envision award achieved by the Authority and its program partners demonstrates that sustainability is achievable across large-scale and complex transportation systems.

The evaluation assessed the program's performance across 64 sustainability criteria addressing a broad array of indicators, including community quality of life, mobility, collaboration, planning, sustainability management, materials, energy, water, economic prosperity, environmental impacts, air pollution, greenhouse gas emissions and resilience.

**“This robust, third-party review of sustainability performance against 64 different issue areas illustrates how the California High-Speed Rail Authority is delivering on its commitment to provide current and future generations a system that protects and restores social, environmental and economic sustainability in its delivery and on into operation.”**

*– Melissa Peneycad  
Institute for Sustainable Infrastructure  
Managing Director*

The High-Speed Rail Program's key sustainability achievements include:

- Leadership and commitment to sustainability and social equity and justice through strategies to ensure pay equity, fair and equitable work environments, and attracting and retaining diverse workforces;
- Recycling 97 percent (183,290 tons) of all construction waste to date and sending only 3 percent (4,973 tons) to landfills;
- A projected reduction in the net embodied carbon of materials used on the program; and
- Net-zero tailpipe greenhouse gas emissions during construction through carbon sequestration projects.

With the Platinum rating, the California High-Speed Rail Program is setting a precedent for rail projects in the United States.

## **ELECTRIC HIGH-SPEED RAIL TRAINS: THE CLEANEST PASSENGER RAIL VEHICLES AVAILABLE**

The electric trains that will be used in California's high-speed rail project will be powered by renewable energy. Electrified high-speed rail plays a unique role in emissions reductions. Due to the dramatic travel time savings relative to interregional automobile trips, high-speed trains attract more people and can move them farther and faster with zero emissions. Even the cleanest Tier 4 diesel trains emit harmful greenhouse gas emissions, whereas electrified trains do not. High-speed rail also attracts passengers from air travel, a transportation sector that is very difficult to decarbonize. Together, passengers switching from planes and cars to electric trains powered by renewable energy will make a big contribution to meeting the State's greenhouse gas emission goals.

Every mile traveled on electrified high-speed rail is a mile not traveled by car or by airplane.

**Exhibit 1.4** shows the projected greenhouse gas emission reductions that are attributable to people switching to high-speed rail. These emissions reductions are based on our updated ridership forecasts and reflect the medium and high ridership scenarios that we prepare for business plans. Over time, the average annual greenhouse gas emissions savings from an operational high-speed rail system in California will take roughly 400,000 passenger vehicles off the road (about the same number of cars registered in San Francisco County) annually.

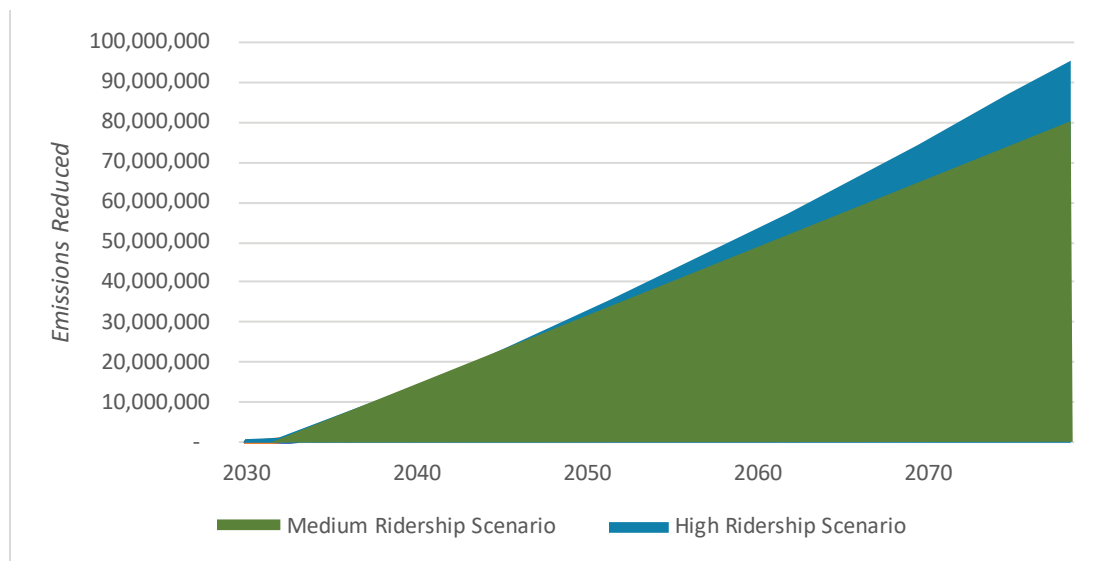
The State of California has undertaken an ambitious climate goal to achieve carbon neutrality for the state by 2045. This goal cannot be achieved through one single action or by any one sector, and it will take significant investment to

achieve. High-speed rail as a single investment will provide as much as two million metric tons of CO<sub>2</sub>e (carbon dioxide equivalent) reduction per year. No other transit or rail investment delivers results at this scale.

For example, the sum of all Transit and Intercity Rail Capital Program (TIRCP) investments to date, across these projects' entire life, total reductions of just over two million metric tons. LA Metro's

total system delivers a net .5 million metric tons of CO<sub>2</sub>e reductions annually, while the BART system achieves a reduction of approximately .7 million metric tons. High-speed rail transfers 30 percent of the intrastate air market to rail. These intrastate, short-haul flights are much more difficult to decarbonize, and no other proven transportation project achieves that result.

**Exhibit 1.4: Projected Cumulative GHG Reductions by 2040, 2050 and by 2079 (Metric Tons of Carbon Dioxide Equivalent - MTCO<sub>2</sub>e)**



High-speed rail stations in California are being designed as multimodal transportation hubs so that connecting to subway, bus, rideshare and/or walking trip will be a more convenient way to make first-mile/last-mile connections. The convenience of high-speed transportation to major cities around the state will increase the attractiveness of urban station area investment, both residential and commercial. High-density

urban infill development will multiply the greenhouse gas reduction benefits as high-quality rail travel stimulates more urban infill which, in turn, generates more riders.

High-speed rail investments being made to achieve long-term emission reductions have also been mandated to provide near-term benefits, particularly in disadvantaged communities. In



the Central Valley, air quality will improve as automobile emissions are reduced.

The Central Valley and Southern California suffer from some of the worst air pollution in the nation, according to the American Lung Association's State of the Air 2020 Report:

- In the Central Valley, Bakersfield is ranked Number 1, Fresno-Madera-Hanford rank Number 2 and Visalia ranks Number 3 by year-round particle pollution; and
- In Southern California, Los Angeles-Long Beach ranks Number 4 by year-round particle pollution.

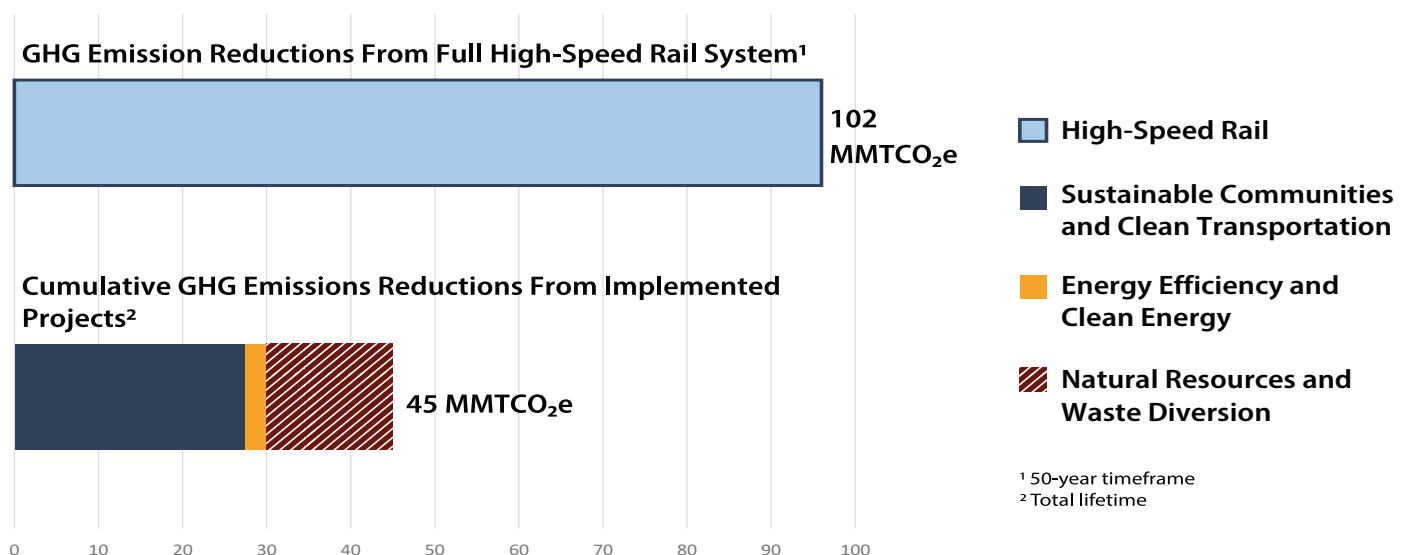
Children under the age of 4 in the Central Valley visit the emergency room or are hospitalized with asthma-related issues at twice the rate compared to the rest of California. Adults in Kings County visit the emergency room or are hospitalized with asthma-related illness 80 percent more than the rest of California; in Fresno County, it's 50 percent more.<sup>1</sup>

Every year, the California Air Resources Board (CARB) presents a report to the California Legislature on the investments of Cap-and-Trade proceeds. **Exhibit 1.5** shows the significant contribution of high-speed rail service to greenhouse gas emissions reductions. This investment of funds delivers a substantial return on investment. CARB anticipates releasing an updated report in March 2021 with revised figures for cumulative greenhouse gas emission reductions from implemented projects.

**“Air pollution, particularly from diesel operation, triggers asthma and asthma attacks. It’s one of the worst and most dangerous substances in the world you can breathe and no matter what you’re told there is no such thing as ‘clean diesel.’”**

— Kevin D. Hamilton,  
Registered Respiratory Therapist  
Co-Director/Co-Founder  
Central California Asthma Collaborative

**Exhibit 1.5:** Climate Investments and Greenhouse Gas Emissions Reductions



## PLANNING AND DEVELOPING HIGH-SPEED RAIL STATIONS

High-speed rail station areas are being designed to meet transformative statewide economic and growth goals. The collaborative planning process that is underway with station cities, regional stakeholders and the Authority reflects the unique characteristics of each city, with the role the stations play in the system evolving over time. In some cases, the Authority will be responsible for planning and building new stations including, for example, stations in the Central Valley. The station sites and the transit-oriented development in them provide key ancillary revenues to the system. In other cases, the Authority is partnering with stakeholders on how high-speed rail will serve stations that are already built and/or are undergoing redevelopment, such as Los Angeles Union Station and many of the stations in Northern California.

In 2021, we will continue our focus on engaging with station cities to identify phasing options that fit within and enhance the local context and incentivize valuable development. To date, we have executed or completed planning agreements with the cities of Gilroy, Merced, Fresno, San José, Bakersfield, Millbrae, Palmdale and Burbank, as well as the Tulare County Association of Governments and the Santa Clara Valley Transportation Authority.

We will also continue to work closely with environmental and public interest groups, developers, investors and others to pursue the development of public spaces and amenities near rail stations. Compact, mixed-use, dense development organized by and responding to visionary new plans for the cities with high-speed rail, along with coordinated local and regional land-use and conservation planning, is vital to maintaining the state's quality of life and sustainability goals.

Attracting a range of new development adjacent to zero-carbon transportation investments is a cornerstone to addressing the pollution generated by transportation. No other state investment provides this opportunity to realize broad-based sustainable economic development, environmental benefits and social resilience.

**“California is facing a housing crisis and a climate crisis. It doesn’t have to be this way. An essential part of solving these challenges is to invest in high-speed passenger rail connections between our cities and regions, and to add new housing and jobs around new stations so that all people can thrive.”**

— Alicia John-Baptiste

President & CEO

San Francisco Bay Area

Planning and Urban Research Association

## FEDERAL CLIMATE MITIGATION PLANS

The Biden administration has stated that it will put a high priority on addressing the effects of climate change. A “Clean Energy Revolution” is at the core of the administration’s plans to achieve a 100-percent clean energy economy and to reach net-zero emissions no later than 2050. The federal administration also plans to target greenhouse gas emissions from transportation, which the new administration has identified as the “fastest-growing source of U.S. climate pollution.”

As noted, these efforts mirror California’s focus on net-zero emissions and reducing greenhouse gas emissions in the transportation sector. The high-speed rail system is a key component of achieving

net-zero emissions in the state by transforming and reducing greenhouse gas emissions in the transportation sector.

High-speed rail is a crucial investment offering essential benefits within these scenarios. As a major state investment in clean, zero-emissions transportation, high-speed rail will provide a vital long- and medium-distance choice for travelers. High-speed rail, unique among current climate investments projects, is a competitive service to air travel, a sector that is slower in reducing carbon emissions.

## High-Speed Rail Creates A New Mobility

California's history of investing in transportation infrastructure has been key to making the state an economic powerhouse. By enabling people and goods to move relatively easily between our population and economic centers, those prior investments advanced the state's economy to what it is today; the 5th largest economy in the world.

### CALIFORNIA'S ROADS AND AIRPORTS ARE REACHING GRIDLOCK

Today's population of 40 million people is straining the state's existing transportation network. California's Department of Finance projects that our population will grow to almost 45 million people by 2050. California's metropolitan areas already have some of the most grueling commutes in the nation. Our highways and roads rank among the busiest in the nation and are nearing, or already exceeding, their capacity. Similarly, California's airports are at or near full capacity.

Because of the worldwide pandemic, travel of all kinds declined in 2020. It can be expected to increase again as vaccines and treatments become more widely available. As the pandemic becomes more manageable and recedes, we can

anticipate that demand for travel will rebound. We are doing the work now to prepare high-speed rail infrastructure to help people make those trips in the future without getting into a car or on an airplane.

Before COVID-19 struck, demand for travel between our population and economic centers—for business, recreation, education and other purposes—was growing:

- In 2018, federal data showed that 13 million passengers flew between the Los Angeles Basin and the Bay Area—making it the single largest air market in the United States. California's major airports saw a 15-percent increase in intrastate air passengers from 2000 to 2017; and
- According to California's 2018 State Rail Plan, interregional travel is forecast to increase to almost 550.5 million trips annually by 2040 on all modes of travel, compared to the estimated 361 million annual interregional trips that Californians took in 2010.

To keep pace, California must expand transportation capacity to improve mobility while being mindful of the state's environmental and sustainability objectives. Electrified high-speed rail meets these objectives efficiently. Without more capacity in the system, people who want or need to travel between California's major cities in the future will experience increased congestion and more delays, which will hinder economic growth and thwart climate objectives. Adding the San Francisco to Los Angeles/Anaheim high-speed rail system to the state's transportation network is equivalent to adding a new major airport and a six-lane highway between San Francisco and Los Angeles.



**“The Authority’s report includes estimates for highway capacity and cost that are within the ranges that Caltrans has experienced**

*in recent years.”*

— Toks Omishakin

Director

California Department of Transportation

### HIGH-SPEED RAIL: A BETTER VALUE THAN BUSINESS AS USUAL

The Authority’s 2019 Equivalent Capacity Analysis Report estimates what it would take and cost to add the equivalent of the high-speed rail system’s people-carrying capacity to the state transportation network using highways and airports.

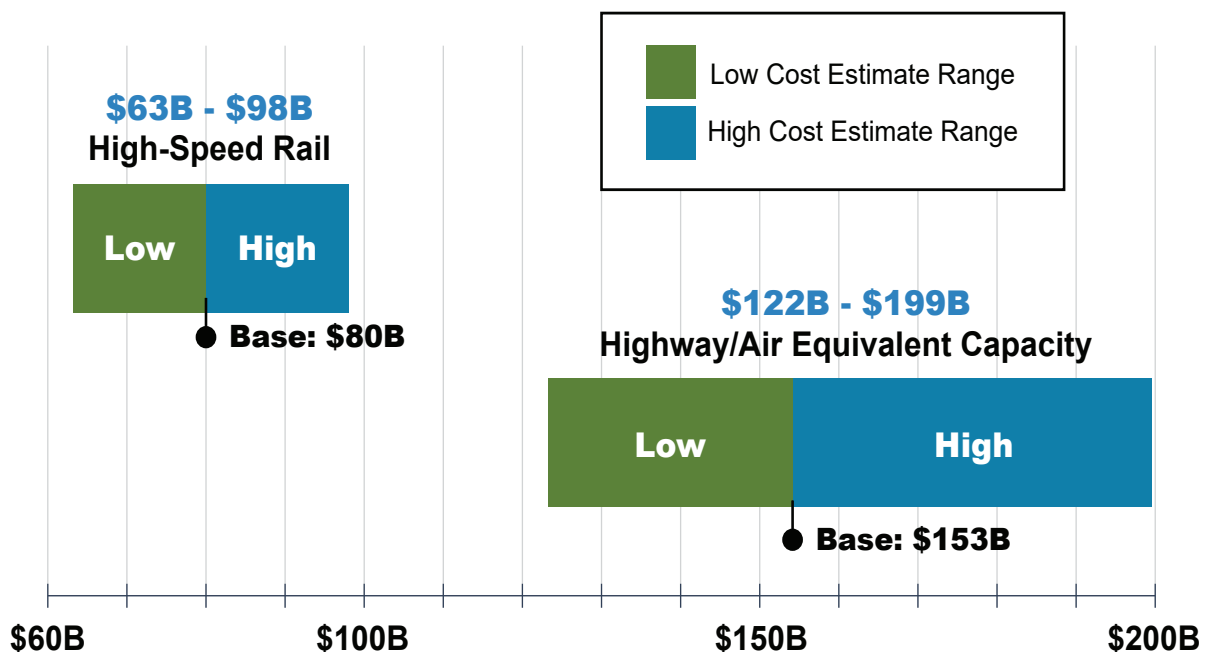
The report’s key finding shows that California would need to construct approximately 4,200 highway lane-miles, add 91 airport gates and build two new airport runways to provide capacity

equivalent to the Los Angeles/Anaheim to San Francisco high-speed rail system.

As shown in [Exhibit 1.6](#), the equivalent roadway and airport capacity would cost about twice as much as high-speed rail and would not advance California’s climate goals. Specifically, the report shows that compared to the \$80 billion year of expenditure (YOE\$) base cost estimate of the Phase 1 system, equivalent highway/airport capacity is estimated to cost approximately \$153 billion (YOE\$). Consistent with the practices we established in our 2018 Business Plan, these estimates are shown in a range. For more information on this report, see [https://hsr.ca.gov/docs/about/business\\_plans/2020\\_Business\\_Plan\\_2019\\_Equivalent\\_Capacity\\_Analysis\\_Report.pdf](https://hsr.ca.gov/docs/about/business_plans/2020_Business_Plan_2019_Equivalent_Capacity_Analysis_Report.pdf).

In the future, as the impact of COVID-19 on travel demand diminishes, high-speed rail will allow California’s airports to focus their resources on addressing the growing demand for interstate and international travel, a major catalyst for sustaining economic growth, and will alleviate growing pressure on our crowded roadways.

**Exhibit 1.6:** Cost of Phase 1 High-Speed Rail Compared to Equivalent Cost in Highway/Airport Capacity (Source: 2019 Equivalent Capacity Analysis Report)



## A NEW MOBILITY

High-speed rail will fundamentally transform how people travel in California. Electrified high-speed trains traveling at speeds of more than 200 miles per hour will connect California's cities, making a trip between Los Angeles and San Francisco in under three hours. These kinds of speeds and travel times are not possible with diesel passenger trains.

**“It’s also useful to outline that, in our experience, there is no high-speed rail without electrification.”**

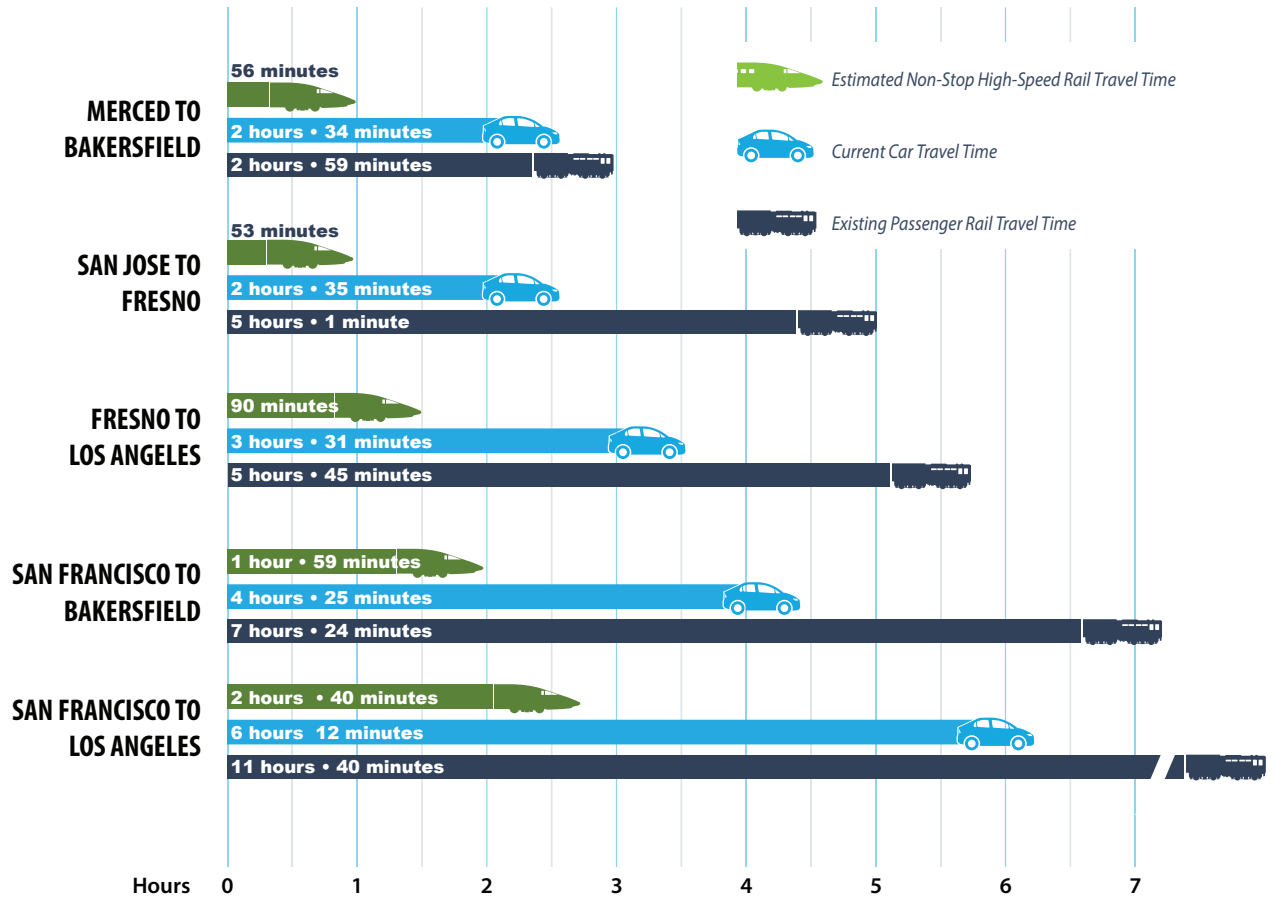
— *Pedro Fortea*

*General Director & Executive Vice President  
MAFEX Spanish Railway Association*

**Exhibit 1.7** shows the time savings that travelers will realize with non-stop high-speed trains connecting the state, including the 3-hour trip between the Bay Area and Los Angeles. Trips to and from the Central Valley will take half the time it currently takes to drive.

The comparative travel times exhibit also shows the faster trip times for travelers on the Merced to Bakersfield corridor. Where it now takes 2.5 hours by car to travel between Merced and Bakersfield—and more than 3 hours by existing diesel passenger trains—travel times will be cut in half. Passengers traveling through this corridor on to other destinations will be able to make convenient connections in Merced to continue traveling to the Bay Area on Altamont Corridor Express (ACE) trains or to Sacramento and Oakland on San Joaquins trains. In Bakersfield, until train connections are possible, passengers can connect to Thruway Buses to continue traveling to destinations in the Los Angeles Basin.

Many countries that initiated high-speed rail service between two major destination cities have seen a considerable shift from cars and planes to high-speed rail. For example, when high-speed rail was introduced between Madrid and Seville, Spain, the share of trips taken by plane was reduced from 40 percent to 13 percent and rail trips grew from 16 percent to 51 percent.<sup>2</sup>

**Exhibit 1.7:** Non-Stop High-Speed Rail Travel Times Compared to Cars and Existing Rail

\*All travel times are approximate. Trips are measured from central business district, existing passenger rail stations, or planned high-speed rail stations. Approximate car travel times were estimated based on the California Statewide Travel Demand Model. Existing passenger rail travel times were approximated using the Amtrak website, referencing schedules current as of publication. High-speed rail travel times are for non-stop service and were estimated by the Authority using internal modeling. Run times do not take into account integration with other operators' services in blended sections.





Photo: Construction progress underway at Wasco Viaduct



# THE COVID-19 PANDEMIC IMPACT ON CALIFORNIA HIGH-SPEED RAIL

## CHAPTER 2

The Novel Coronavirus Disease (COVID-19) pandemic generated a global economic crisis and uncertainty as to when this public health emergency will end. The pandemic has affected every sector of the state's economy, and California high-speed rail is no exception. The California High-Speed Rail Authority made changes to the way it does business in response to the pandemic's significant impacts, such as furloughed state staffing, quarantined state and contracted workers, contract Force Majeure event notifications, extensions on policy decisions and delays to high-profile procurements.

On February 12, 2020, the Authority issued its Draft 2020 Business Plan. One month later, the global COVID-19 pandemic caused federal, state and local governments to issue what would be the first emergency "stay-at-home" orders to protect citizens' health and well-being. These significant challenges have resulted in changes to the costs and schedule outlined in the 2020 Business Plan. At the same time, we have seen shocks to the Cap-and-Trade markets resulting in lower auction proceeds and funding amounts from the last two quarterly auctions. This has already resulted in a reduction of more than \$288 million compared to what auctions produced in past years. These revenue shortfalls may continue to grow as the pandemic goes on.

Like other state agencies and infrastructure programs across the country, the Authority is experiencing dynamic and unpredictable conditions due to COVID-19 that affect every

aspect of daily work. The program has been affected directly in many ways by the ongoing and still-evolving pandemic, ranging from state budget shortfalls which have resulted in furlough days for state staff, extensions for public comment periods on draft environmental documents and specific impacts on construction in the Central Valley as described below. As a result, previous summarized schedules have been affected.

In a March 20, 2020, letter, the Authority notified the Federal Railroad Administration (FRA) of Changed Conditions of Performance. This letter notified the FRA of possible impacts on construction progress due the national and state emergency declarations related to the Novel Coronavirus Disease (COVID-19) proclamations. These proclamations resulted in a statewide stay-at-home order and implementation of social distancing requirements. Subsequently, as part of annual deliverable updates, the Authority updated the FRA on September 30, 2020, identifying specific impacts and the continued risk to project delivery from the pandemic.

The pandemic's "third wave" significantly affected Central Valley work at the end of 2020. Several counties experienced widespread increase in positive infection rates. This affected all Construction Packages. Construction Package 1 has been significantly impacted where operations were forced to shut down due to positive infections and worker quarantines.

The delays in construction activities are requiring schedule adjustments, such as pushing schedules to later dates, while work has progressed, as detailed in the following chapter.

We are making every effort to manage and mitigate the challenges facing the staff, construction personnel and project schedules. However, given that the pandemic remains ongoing, these impacts and the corresponding downstream effects are still unfolding, with considerable risk to future program revenues, performance and schedules. This uncertainty requires the Authority to better understand, manage and mitigate risk.

## State Staff and Organizational Functions

From March through December, high-speed rail state employees statewide have been impacted by COVID-19. As of early December 2020, high-speed rail staff was operating on a 97 percent full-/part-time or rotational telework status. Management monitors staff health conditions and associated remote working and other cost impacts and the administrative office impacts. These have included:

- Sacramento Corporate Office: Fourteen employees were quarantined, and five tested positive.
- Regional Offices (San José, Fresno and Los Angeles): Eight employees were quarantined, and four tested positive.

In addition, the State implemented a two-year furlough program for all state employees, which includes two days of unpaid leave per month (a roughly 10-percent pay reduction). The furloughs reduce state staffing resources across all departments, including the Authority. This has affected internal and external coordination and workflows between various state functions and other agencies as they manage through their own budget shortfalls and staffing challenges.

## Construction and Supply Impacts

Since March 2020, the progress of the construction work across the three Central Valley Construction Packages (CPs) has been affected by both worldwide and California-specific events. All three design-build contractors have notified the Authority formally, under their contracts, that they consider the COVID-19 pandemic to be a *Force Majeure* event. A *Force Majeure* event in construction typically represents extraordinary situations, such as events considered to be acts of God (natural events such as earthquakes or severe weather events), strikes/labor disputes, acts of governmental authorities (changes in law) or war, terrorism and epidemics.

In addition, contractors implemented new work requirements related to social distancing, as well as other added health and safety procedures. These important safety measures are essential for worker safety, but they are additive to daily work activity routines. The pandemic, added to other known risks, has created delays, constricting an already compressed construction schedule and making the goal of achieving the December 31, 2022, federal grant deadline even more difficult.

As of December 2020, when the three construction packages (CP 1, CP 2-3 and CP 4) averaged 1,129

daily workers, there were nearly 100 reported COVID-19 events affecting the construction packages, which required workers to quarantine. Positive infections and quarantines steadily increased since the start of December, leading to the eventual closure of the Project Controls office for CP 1. The average workers impacted per day was 37 in December, compared to seven in November. Initial data on COVID impacts to the project from January reflects the widespread effects of the pandemic.

From March through the beginning of December, the impact of COVID-19 on the project fluctuated. As noted below, several months had singular events resulting in a spike of quarantined individuals. Contrary to other months, data from December 2020 shows a sustained number of quarantined individuals rather than a singular event. **Exhibit 2.0** shows the ongoing impacts to

construction workers and three peak events that affected construction staff and workers:

- May 20 to 25, 2020: Individuals working onsite at the Wasco Viaduct reported positive tests, which resulted in 45 people quarantined. All 45 people tested negative and eventually returned to work;
- July 9, 2020: Two individuals working in the CP 2-3 office in Selma tested positive, resulting in 91 people temporarily quarantined. The conjoined offices of both the contractor and the project construction manager were vacated and sanitized; and
- December 2020: The number of quarantined individuals rose from 18 on December 1, 2020, to 46 on December 14, 2020. As of December 31, 2020, 39 individuals were quarantined.

#### **Exhibit 2.0:** Central Valley Quarantine Summary 2020





In addition, some supply contractors across the Central Valley were shut down for varying periods as employees were affected by COVID-19. This affected production facilities for concrete, precast concrete units for mechanically stabilized earth walls, reinforced concrete pipe, steel column formers for bridge columns and steel fabricated elements (reinforcement cages, handrails, etc.).

Equipment challenges, including adequate sanitizing supplies for shared equipment, also slowed work. Some contractors responded by purchasing tools for specific individual use to reduce sanitation time and supply requirements. In addition, contractors have added sanitization work

requirements for shared resources, affecting overall production work periods.

Due to increased safety requirements, including social distancing, sanitization and increased safety meetings, daily working hours have been reduced by 25 percent to 50 percent depending on the location. Since March, COVID-19 infections and smoke-related shutdowns have affected various construction locations, as shown in **Table 2.0**, resulting in a total of 244 workers quarantined and more than 100 person-days lost (a “person-day” is not the same as a working day; for example, 10 person-days is 10 people off work for one day, or one person off work for 10 days).

**Table 2.0: Pandemic and Air Quality Construction Site Impacts**

Construction Package	Location	Person-Days Missed	Workers Quarantined
1	Survey Crew, Fresno County	10	4
1	Underground Crew, Fresno County	10	7
1	MSE Walls, Ave 11-12, Madera County	10	7
1	Road 27, Madera County	1	10
1	Fresno Site Office, Fresno County	8	18
2-3	Segment 1, Fresno County	2	40
2-3	Hanford Viaduct, Kings County	3	5
2-3	Selma Site Office, Fresno County	10	1
2-3	Selma Site Office, Fresno County	10.5	132
2-3	9th Avenue and Cairo, Madera County	2	10
2-3	Hanford Viaduct, Kings County	10	1
4	Kimberlina, Kern County	10	6
4	Wasco Viaduct, Kern County	2	1
4	Garces Road & Pond Ave, Kern County	16	2
<b>Total</b>		<b>104.5</b>	<b>244</b>

## IMPACTS ON RIGHT-OF-WAY ACQUISITION AND THIRD-PARTY AGREEMENTS

The Authority has experienced significant delays in processing legal documents necessary to acquire property because courts are taking longer to record or certify those documents. Certified copies of cases which the Authority previously received within two to three days are now taking six to eight weeks.

Social distancing practices, quarantines and remote working have delayed finalizing agreements and design approvals with irrigation districts; Fresno, Madera, Tulare, Kings and Kern counties; the cities of Fresno and Wasco; state departments; the Union Pacific and BNSF railroad companies; and utilities, such as PG&E, AT&T, SoCal Edison and Sempra.

PG&E's shelter-in-place agreement stopped all utility work that could impact the residential and commercial properties in Fresno and across the Valley from April to mid-June. This required contractors to reschedule utility relocation work. This also affected previous design approvals impacted by PG&E's "6-month shelf life rule" requiring designs to be resubmitted that had not been constructed within six months of previous approvals. This further delayed construction for an additional review cycle.

In summary, the impact to construction reported by contractors has been related to third-party coordination delays that we are not always able to control. This has included finalizing agreements and completing the utility and other designs to execute early work construction. The remaining impacts to construction are solely due to pandemic affects and are equally distributed

between three other categories as summarized below.

- Workforce absenteeism due to COVID-19 infection or quarantine: 20 percent;
- Material supply: 19 percent; and
- Equipment: 19 percent.

The severity of these construction impacts has varied in terms of cost and schedule. To enable a subjective assessment of events, the following categorizations were determined:

- **Significant:** The event has impacted the critical path, which represents 61 percent of the recorded impacts;
- **Limited:** The event is impacting this activity but does not impact the critical path, which represents 26 percent of the recorded impacts; and
- **None:** The event is not impacting construction progress at the time of notification which represents 13 percent of the recorded impacts.

Of the impacts identified above, roughly two thirds have had a significant impact to construction progress.

## Effects on Track and Systems Procurement

The pandemic has also impacted the track and systems contract procurement process. Two pre-qualified international teams are preparing proposals to design, build and maintain the track and systems necessary to test and operate electrified high-speed trains. During this process, various COVID-related restrictions around the world required major adjustments to how the bidders coordinated their proposals.

The proposal teams' ability to conduct project site visits and to secure supply chains, subcontractors (and small businesses in particular) and necessary third-party agreements have been affected by shutdowns, travel restrictions and fluctuating market conditions. The Authority has extended the proposal deadline to July 2021. This will allow the teams to respond to updated contract provisions and allow adequate time to prepare quality proposals. The deferral will allow the Legislature time to consider the Authority's Central Valley construction schedule and program implementation strategy. This will allow the bidders to assess the effects that decisions may have on construction schedules and the sequencing of Notices to Proceed for track and systems installation.

## Impacts to Environmental Documents

The Authority's federal grant agreement requires that all project sections between San Francisco and Anaheim be environmentally cleared by December 2022. Typically, environmental documents require a 45-day public comment period, and the Authority offers a range of options for the public to submit comments.

Since the onset of the pandemic, local communities and other stakeholders have requested extensions to these public comment periods to ensure that everyone has ample time to provide comment. The Authority extended public comment periods on all environmental documents released during the pandemic as summarized below:

- **San Francisco to San José:** 16-day extension;
- **San José to Merced:** 15-day extension;
- **Bakersfield to Palmdale:** 15-day extension; and
- **Burbank to Los Angeles:** 45-day total extension.

For each of the documents recently circulated for public comment, we received more submissions overall and substantially more comments that required robust responses than anticipated. As an example, for San José to Merced, almost 5,000 comments were received, and more than 1,800 comments required individual and in-depth responses that did not fit within a general standard response.

Depending on the status of the pandemic, the possibility remains that the two remaining Draft EIR/EIS documents may require extended public comment timelines as well. These extended review periods have affected the Authority's overall environmental review schedule.

Due to new COVID-19 restrictions, noticing, meeting requirements and procedures have been modified in accordance with new state Executive Orders and federal requirements. Many local county and city offices that would typically post notices of the Draft EIR/EIS and provide a public viewing area for hard copies of the document have been closed. Additional Authority resources

have been required to identify alternative methods to publicize the Draft EIR/EIS availability and comment period. New remote learning procedures and virtual platforms were developed to engage the public and stakeholders consistent with public health and safety requirements, and additional resources were established for communities with limited online capabilities or those that needed additional language resources.

The size and complexity of these environmental documents require substantial interagency coordination with federal and state agencies, but these federal and state agencies are suffering from disruption to their existing commitments as a result of COVID-19. The Authority is working with these agencies to extend the timeframe for their required reviews, further delaying the environmental completion dates.

## Effect on Cap-and-Trade Revenues

Revenues from the May, August and November Cap-and-Trade auctions have been lower than prior auctions. For auctions between the time that Assembly Bill 398 extended the Cap-and-Trade Program through 2030 (effective July 2017), and when COVID-19 emergency orders were in place, each quarterly auction produced an average of \$180 million for the Authority. In contrast, after the COVID-19 emergency orders, the May 2020 auction produced only \$6 million for the Authority, the August auction produced \$99 million for the Authority and the November auction produced \$147 million.

If these auctions had performed at historical average levels, the Authority would have received approximately \$288 million more in proceeds from auctions in May 2020 through November 2020. Although the August 2020, November 2020

and February 2021 auctions showed marked improvement from May 2020, economic impacts related to the pandemic continue to present significant downside revenue risks for future 2021 auctions.

In the near term, this has affected the Authority's cash flow. Although, in the longer term, we anticipate that the program will rebound as recently unsold Cap-and-Trade allowances will ultimately sell when offered in the future for resale, it is uncertain how long the effects will continue for cashflow and, ultimately, revenue levels.

The Authority analyzes its cash flow position every month to understand upcoming cash flow needs to determine where potential pinch points may exist in funding availability relative to construction capital outlay. The short-term impacts of the reduction in Cap-and-Trade revenues have resulted in projected cash shortfalls for the program. If these shortfalls were to continue, the lack of funds could affect the progress of construction in the Central Valley.

Access to the remaining Proposition 1A funds in 2021 is urgent to advance the construction work currently underway in the Central Valley. In addition to expanding the growing labor workforce on the project, dedicating the remaining bond funds to their intended purpose of project construction will mitigate any schedule impacts and will allow the Authority to use the more flexible Cap-and-Trade funds for other program priorities over time. The Authority will continue to actively monitor and manage its funding sources to ensure that program construction can progress with minimal impacts.



## COVID-19's Effects on Public Transit Agencies

The California High-Speed Rail Authority was neither spared nor alone in having to confront the adverse impacts from the COVID-19 pandemic. Throughout 2020 and into 2021, public transit agencies have been severely impacted across the nation. As a vital part of the American economy, public transit directly employs an estimated 435,000 workers and supports millions of private-sector jobs.<sup>3</sup>

The effects of COVID-19 on this industry have been devastating. It is estimated that California transit agencies will face a shortfall of \$23.8 billion through the end of 2021.<sup>4</sup>

In March 2020, Congress provided \$39 billion in aid to public transit operators through the Coronavirus Aid, Relief, and Economic Security (CARES) Act, with California receiving \$3.6 billion. In December 2020, another COVID-19 relief package for transit operators provided \$14 billion, with California receiving \$1.9 billion. The California High Speed Rail Authority has received no federal aid to mitigate COVID-19 impacts to this project. In September 2020, after using federal emergency stimulus funds, LA Metro reduced its fiscal year 2021 budget by \$1.2 billion in anticipation of ongoing revenue

impacts. This 20-percent budget cut formalized service cuts but also reduced budgets on dozens of Metro capital initiatives, including new rail lines. In Northern California, rather than adopting an annual budget, Caltrain is evaluating its spending each fiscal quarter and will consider a pandemic-related risk contingency for its construction budget. The Authority is proposing a similar action.


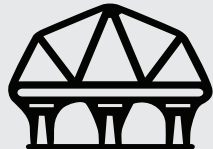

As federal policy makers debate possible additional stimulus funding or new infrastructure legislation, public transit agencies nationwide will also be considering reductions to capital programs. The uncertainty of the pandemic will continue to create numerous risks to capital program schedules and costs. The California High-Speed Rail Authority is in a similar situation and may also require federal assistance to mitigate COVID-19 impacts.

Although the Authority has suffered considerable setbacks from the COVID-19 pandemic affecting our cost and schedule, we have been able to expand job creation and advance the work, as outlined in the following chapter.





Photo: Construction progress underway at South Avenue in Fresno County

	2018	2020
 Construction Jobs Created	2,573	vs. <b>5,216</b>
 Structures Completed or in Construction	19	vs. <b>56</b>
 Environmental Drafts Released and RODs Certified	5	vs. <b>12</b>
 Right-Of-Way Parcels Acquired	1,423	vs. <b>1,771</b>
 Miles of Guideways	47	vs. <b>79</b>
 Annual Average Expenditures on Design-Build Contracts	\$30.47M	vs. <b>\$68.13M</b>
Progress from December 2018 to December 2020 (expenditures as of November 2020)		



# ADVANCING THROUGH CHALLENGES

Before COVID-19 began, we were advancing work on many fronts and were seeing progress. This chapter outlines some of those achievements since 2018. As shown on the opposite page, we more than doubled the number of construction jobs created, nearly tripled the number of structures completed or in construction and more than doubled the number of environmental documents released and certified.

Notwithstanding the current issues we are facing with the pandemic, within the next 12 to 15 months we plan to:

- Complete environmental documents on nearly 300 miles of the 500-mile Phase 1 alignment from San Francisco to Los Angeles/ Anaheim;
- Substantially complete our first construction segment from the Kern County line to Poplar Avenue in Shafter, Construction Package 4; and
- Begin work on track and systems installation.

The Administration and the Legislature have completed important appointments to our Board of Directors and senior staff leadership. We are continuing work to further perfect the organization's Program Management Plan to clarify organizational roles and responsibilities, to enhance contract-management staffing, and to define consultant and State roles. We increased transparency through detailed reporting to the Board of Directors and the Finance and Audit Committee, including posting construction change orders on our website. We adopted a cost and

schedule Program Baseline and implemented a governance process for more decision-making rigor.

With the Federal Railroad Administration (FRA) approval of our application for National Environmental Policy Act (NEPA) Assignment, we were the first state in the nation to take on responsibility for federal rail infrastructure environmental review. We completed an environmental Record of Decision (ROD) for the extension to Bakersfield in 2019 and for the extension to Merced in 2020. Also in 2020, we released four of the remaining six draft environmental documents for the San Francisco to Anaheim Phase 1 system.

On the construction front, we resolved numerous past issues that encumbered construction progress for multiple years and are gaining construction momentum daily. We completed critical third-party agreements and built stronger relationships with key stakeholders resolving program-related issues. We have worked with the design-build contractors to identify ongoing risk and implement cooperative strategies to minimize cost and schedule delay impacts. We resolved issues earlier and cleared areas for construction. This has doubled the amount of activity over the last year.

This work has resulted in an increased number of active construction sites, putting thousands

## CHAPTER 3





Photo: Aerial shot of Poso Creek structure



of workers on the job, engaging hundreds of small businesses and providing the framework to build the nation's first high-speed rail system in California.

The Authority started construction in the Central Valley in 2015 under an agreement with the FRA. Expanding this work is important for the Central Valley and the state. The ongoing construction will continue to contribute to the economic stability of this region and advance the project toward operable high-speed rail in California. Today, we are turning the corner toward completing the first 119-mile segment. We propose to build out from what was started to achieve a viable interim operating segment between Merced and Bakersfield. Chapter 4 discusses further our recommendations to extend beyond this initial 119-mile segment.

## Meeting Our Federal Commitments

The Central Valley was selected by the federal government to receive American Recovery and Reinvestment Act (ARRA) funds in 2009 to begin high-speed rail construction. In its October 2010 selection notification letter, the FRA noted that the Authority's application met broad program objectives and strategic transportation goals—including economic recovery benefits (including job creation) and environmental benefits.

The FRA agreed that construction in the Central Valley met these goals for several reasons:

- The Central Valley suffered from one of the highest unemployment rates in the nation, reaching nearly 17 percent in 2010;
- The Central Valley has long experienced the negative effects of some of the worst air quality in the nation;
- The construction work provided immediate recession relief through design and construction. Today, the economic benefits that have been achieved are profound, and we remain committed to completing what was started with these federal funds; and
- Development of a high-speed rail test track for high-speed rail trains, systems and technology is an important milestone toward advancing this industry and transportation option in the United States.

The 119-mile segment under construction offers a segment ideal to test and certify the nation's first electrified high-speed rail system. To maximize a sensible operating segment, we propose to extend this first construction segment to move beyond the orchards and connect the three major cities of the Central Valley—Merced, Fresno and Bakersfield—creating a preferred interim operating line.

## Making Progress

The 2018 Business Plan identified a series of “lessons learned” and actions we would be taking as we move forward. Since its publication, we have worked diligently and prudently to evolve our program and project delivery. Our project execution has centered on managing interrelated work and focusing staffing and financial resources toward the achievement of specific and necessary tasks. This evolution has taken many forms and facets and has transformed every part of the organization. It has given the organization cohesion, tenacity and rigor to achieve a single purpose—building America’s first high-speed rail system.

We are seeing results. Not only is construction activity increasing in the Central Valley, but also in other parts of the state. Today, we see construction in Northern California through the Caltrain Electrification project and the San Mateo grade separation project that will support future high-speed rail operations. Proposition 1A funding has been dedicated to the expansion of Los Angeles Union Station and significant new rail construction to allow service to pass through the station rather than dead end there. Finally, construction will begin on the Rosecrans/Marquardt grade separation in 2021, eliminating what was once rated as one of the most hazardous grade crossings in California by the California Public Utilities Commission.

## Central Valley Results

We have outlined in prior reports the challenges of advancing construction while so much preparation work was still underway. Across every metric—structures and guideway construction, workers on site, monthly expenditures, right-of-way acquisition, third party agreements and more—the Authority is seeing the results of the organization’s effort to improve management and project execution in the Central Valley.

Results are not limited to numerical values. Progress and results from construction in the Central Valley is being seen throughout the state. On **Exhibit 3.0**, the Authority is proud to display before and after pictures at various structures in Construction Packages 1, 2-3, and 4.

Over the last two years, we have focused extensively on removing the barriers to construction. As a result, construction in the Central Valley is advancing at an increased pace, even under the pandemic restrictions. We monitor construction progress and momentum through a series of management tracking tools and key performance indicators. These are internally reviewed monthly through project meetings and program governance oversight. These project tools indicate we are making progress and have identified emerging issues to be addressed. These key performance metrics are summarized and consolidated into the monthly Central Valley Status Report. This report is reviewed in detail with the Board’s Finance and Audit Committee, summarized for the full Board of Directors and posted on the Authority’s website for public review.

We expect to complete our first construction package in the Central Valley, from the Kern County line to Shafter (CP 4) by the beginning of 2022.

**Exhibit 3.0:** Progress at Construction Sites in 2018 Compared to 2020

**CP 1: San Joaquin River Viaduct and Pergola**



**CP 2-3: Conejo Viaduct**



**CP 4: Wasco Viaduct**





## MORE SITES OPEN AND MORE WORKERS ON THE JOB

Currently, an average of more than 1,100 workers are dispatched each day to 35 active construction sites between Madera and Kern counties, an increase of 130 percent from one year earlier when there were only 449 average daily workers. We continue to work with each construction contractor to ensure that safety protocols and guidelines from the Centers for Disease Control and Prevention (CDC) and the Occupational Safety and Health Administration (OSHA) are being followed during the pandemic.

We are reducing project delay impacts, relocating utilities and resolving commercial contractor claims to increase construction productivity. In November 2020, all 272 major design packages were nearly complete across all three construction segments. For the first time, the current construction footprint is defined, allowing for the final identification of all associated parcel procurements and easements, utility relocations, third-party approvals and environmental permit modifications for

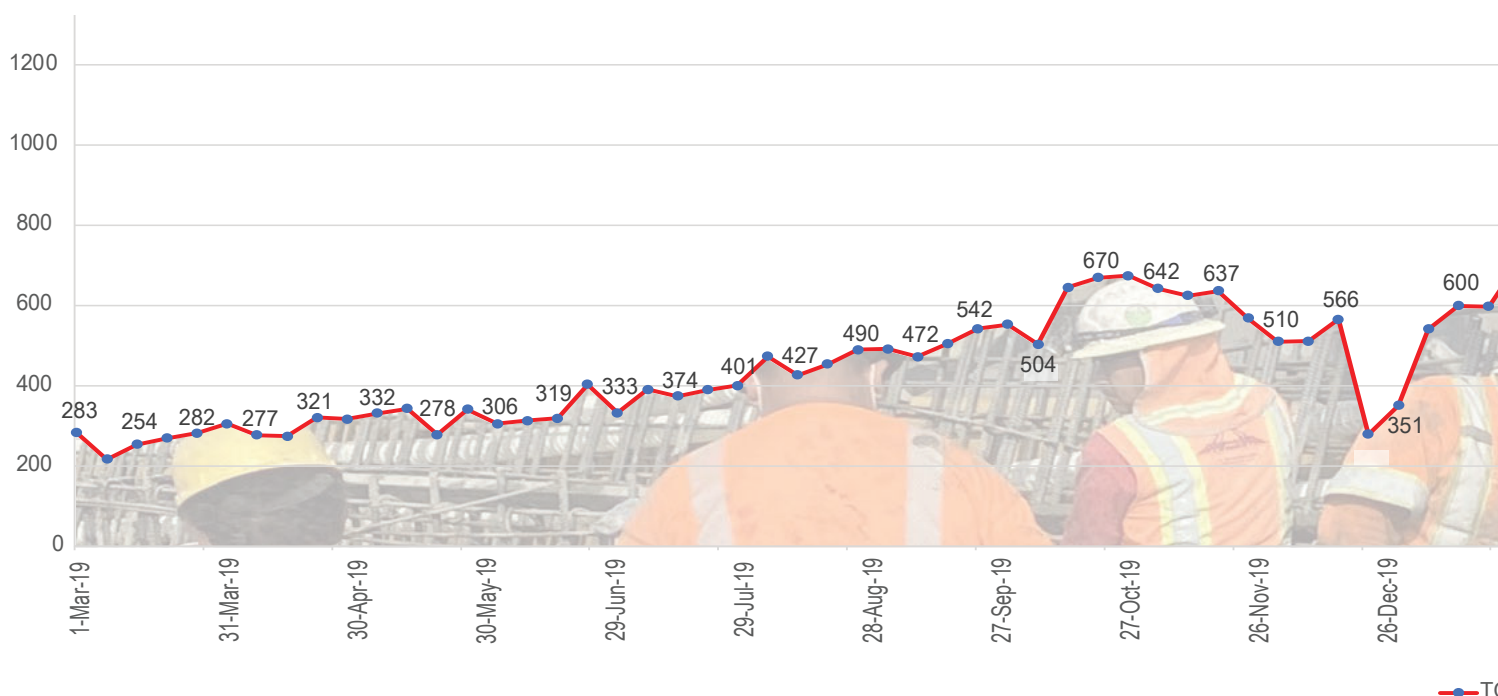
construction. The end of the difficult beginning is in sight.

As more sites open, more workers are employed, as shown in **Exhibit 3.1**. As of December 2020, more than 5,000 construction jobs have been created, and 574 small businesses engaged in various aspects of the project, including environmental work and building bridges, viaducts, grade separations and other high-speed rail infrastructure.

## CONSTRUCTION IS ADVANCING

Progress in 2020 has seen the completion of multiple structures across the first 119 miles of construction. Overpasses were completed at Avenue 15, Avenue 10 and Avenue 7 in Madera County. In late October, the Poso Creek Viaduct in Kern County was completed—the first structure completed in Construction Package 4. In November, the American Avenue overpass in Fresno County opened, and, in January 2021, the Garces Highway Viaduct was completed. These structures allow the high-speed rail line to cross roadways, canals and other water features, and

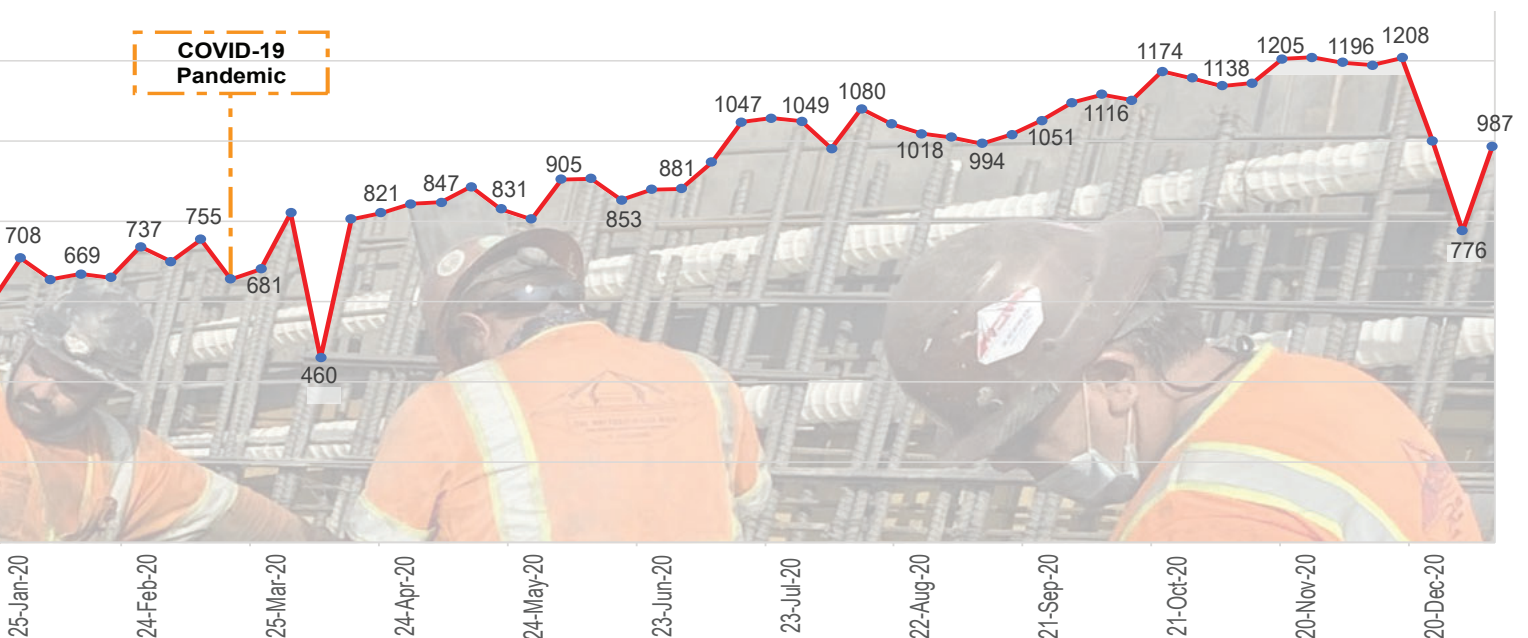
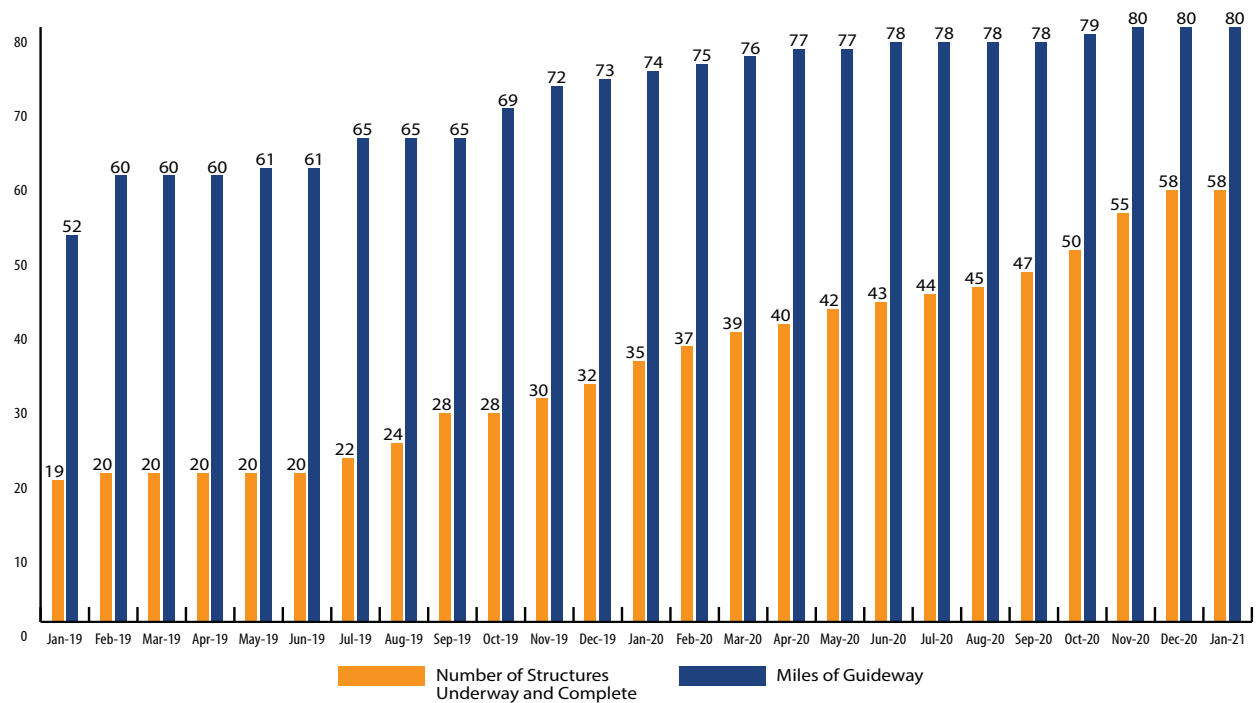
**Exhibit 3.1: Average Weekly Workers Dispatched**



existing freight tracks. They eliminate rail crossing hazards and reduce harmful greenhouse gas emissions caused by idling vehicles waiting at rail crossings. We are making significant progress on many other structures.

Since March 2018, the Authority has advanced significantly the number of open work sites all along the 119-mile alignment. **Exhibit 3.2** shows structure and guideway progress over the last year.

**Exhibit 3.2: Structure and Guideway Progress**



### Veterans Boulevard Interchange and Corridor Improvement Project:

This project is a comprehensive, multimodal improvement that includes construction of a new six-lane arterial roadway, an interchange with SR-99, grade separations over Union Pacific Railroad and California high-speed rail tracks, and the realigned Golden State Boulevard. It also includes a pedestrian trail and improvements to adjacent roadways.

The Authority contributed \$28 million for Phase 1 and 2 of this \$138.5 million project. This contribution, plus local funding and the City of Fresno's recent receipt of a 2019 U.S. Department of Transportation BUILD grant award for \$10.5 million, fully funds the project.



### Hanford Viaduct

Located in Kings County just east of State Route 43, this 1.2-mile structure will carry high-speed trains over Grangeville Boulevard, San Joaquin Railroad and State Route 198. This viaduct is the longest aerial structure of the 119-mile initial construction. An average of 100 field staff are utilized on a weekly basis to construct the substructure, which is nearing completion. In 2021, nearly 1,000 elevated beams, being manufactured at the on-site casting facility, will begin to be placed, creating a striking visual image of high-speed rail progress in the Central Valley.

### Wasco Viaduct

This nearly half-mile long structure in the City of Wasco will take high-speed trains over existing BNSF Railway tracks near Jackson Avenue. To the north, crews have completed the 34-foot high sound walls to protect the surrounding community. Starting early this year, the first of the guideway panels will be put in place on the already installed girders constructed. By year's end, the pergola and final panels will be in place and the entire half-mile alignment will be ready for track installation.





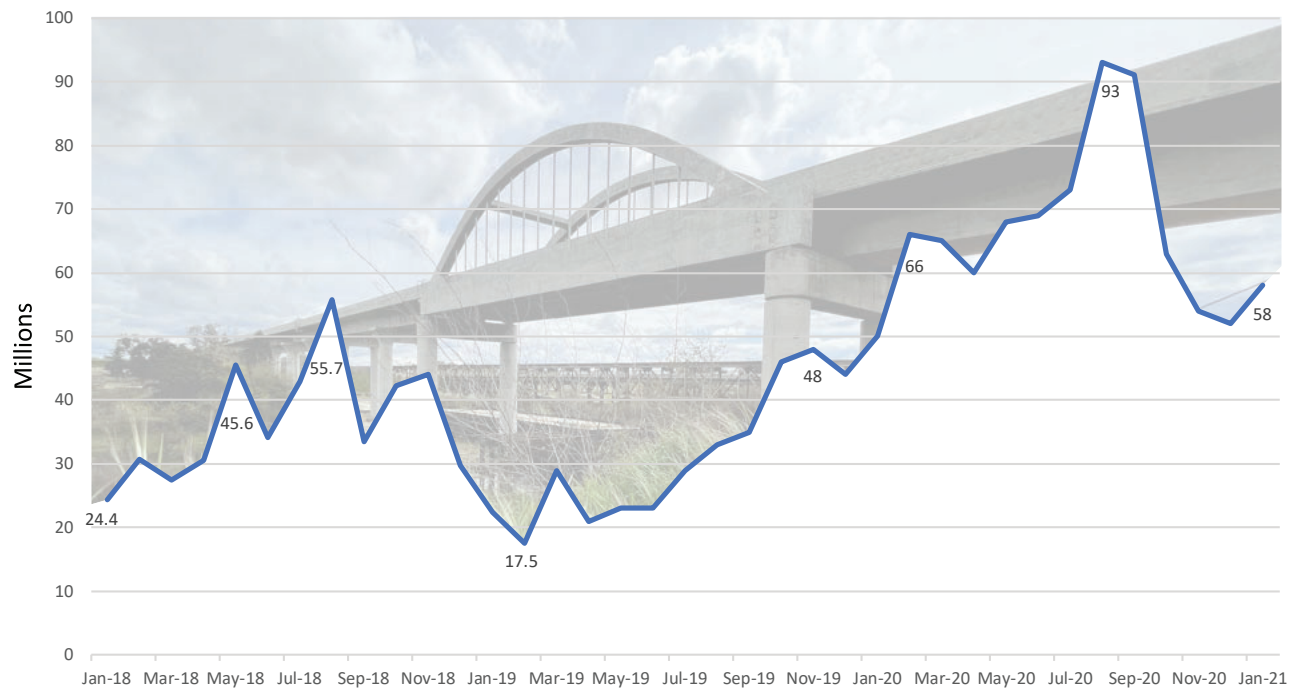
## EXPENDITURES HIGHLIGHT CONSTRUCTION PROGRESS

Executive leadership set out a construction expenditure plan aligned with the Program Baseline schedule expectations. As of November 2020, construction expenditures totaled approximately

\$2.95 billion, with almost a third of that total expended in the last 12 months.

Expenditures for the three Central Valley design-build construction contracts have more than doubled, as shown in **Exhibit 3.3**.

**Exhibit 3.3:** Design-Build Construction Packages - Monthly Expenditures (\$ in Millions)





CONTINUING TO CLEAR THE WAY FOR CONSTRUCTION

Authority staff continue to work with the contractors to complete designs, resequence work activities and prioritize work for construction of critical path structures and guideway. In addition, staff also are working with property owners and other stakeholders to obtain early access for construction activities to begin. The following describes some of the major successes.

RIGHT-OF-WAY ACQUISITION

The Authority recognizes the risks and past challenges associated with right-of-way delivery and has made significant process improvements. Passage of Senate Bill 1172, allowing the Authority to directly acquire right of way through purchase and eminent domain, initially reduced processing times by an average of 75 days. This and other changes have made processing more efficient, accelerating the rate parcels enter into negotiation and reducing overall processing times by approximately 30 percent.

The first improvement included coordinating closer with the contractors to align ongoing parcel requirements with contractor designs. As designs along the first 119-mile segment are nearing completion, we will be able to more accurately identify the parcels necessary to complete construction. Our work to date has identified 2,290 parcels necessary for construction, as shown in Table 3.0. By the end of 2021 we expect to have more than 90 percent of these acquisitions completed.

Table 3.0: Right-of-Way Parcels Status

Delivered To Date	Projected Delivery 2021	Remaining
1,771	354	165

The second area of improvement has been linking identified parcels to construction schedule milestones. This has aligned right-of-way actions and activities to construction requirements to provide more construction certainty. This information is compiled in a single tracking database—GeoAmps. Acquisition milestones are tracked, and construction and right-of-way efforts are coordinated.

Authority staff have defined a schedule for the remaining parcels to be acquired. The improvements above, as well as others, have resulted in:

- Streamlining the pre-acquisition and utility land conveyance processes;
- An improved database and interactive visualization of key performance indicators to track, monitor and communicate parcel access and delivery;
- Consolidating acquisitions affecting related parcels;
- Improved communication and collaboration between parcel delivery partners for efficient contractor delivery; and
- Added staff to oversee and expedite the process.

This same rigor and discipline has been applied to land rights conveyance—resulting in more than 700 land conveyances being processed in 2020. This significantly released work related to utility relocation and clearing areas for construction to progress. Because of these steps, we have reduced the time necessary for land conveyance by 100 days and the pre-acquisition process by 40 days.

### THIRD-PARTY AGREEMENTS

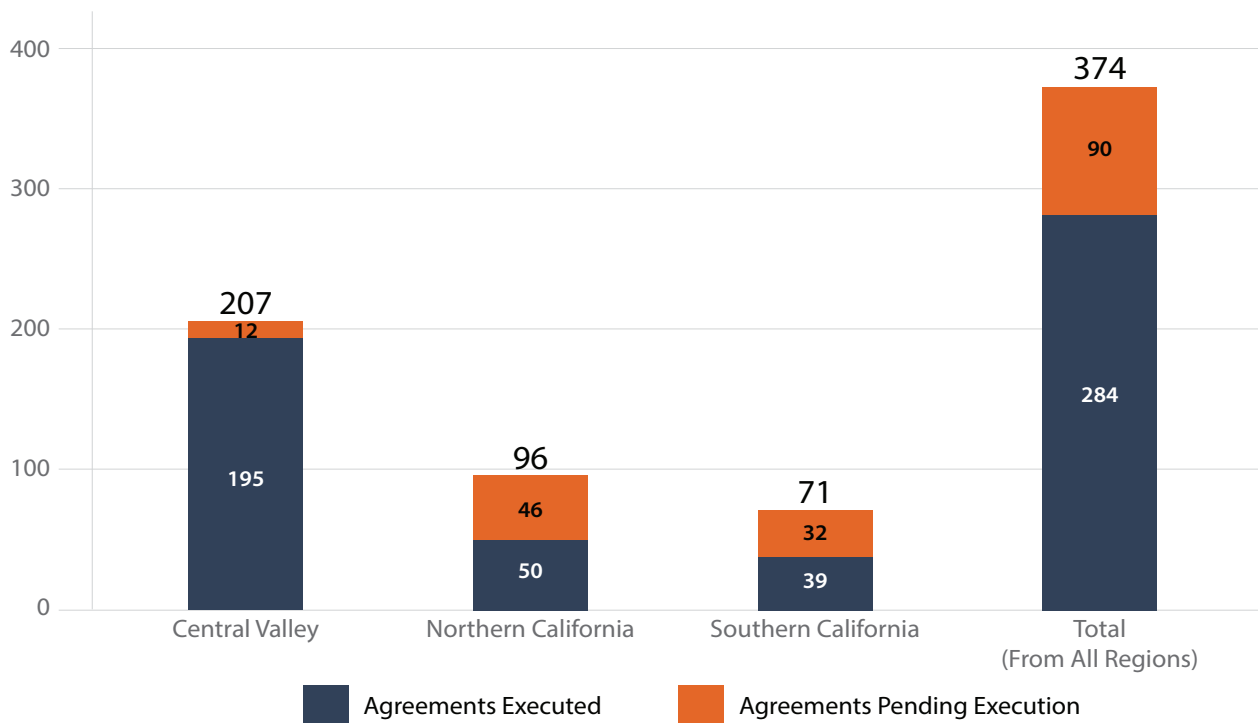
While gaining a greater understanding of the construction barriers and outstanding contractor concerns, staff worked to build stronger relationships with third-party partners. As that work was underway, staff worked to prioritize the outstanding agreements necessary for construction.

One of the strongest indicators that construction is advancing is the number of utility relocations completed or underway. This is the critical predecessor work, known as “first-order work,” to start individual site construction. As of November 2020, 53 percent of utility relocations are complete/underway/scheduled. This is a dramatic increase over the last two years.

Master agreements are in place with BNSF Railway and Union Pacific Railroad, and construction of key projects is increasing access to high-speed rail construction sites. Master agreements are also in place with key utilities, including AT&T, PG&E and various irrigation districts. We have added additional staff with specialized expertise to assist with complicated utility agreements and relocation coordination. We are also focusing on regular coordination, engagement and a single point of contact with these third parties to drive better outcomes and ensure program-wide consistency.

Over the last year, we signed 45 agreements/amendments, 34 of which were critical to supporting and advancing construction activities. As shown in [Exhibit 3.4](#), the Authority has made progress toward resolving issues with our partners and moving closer to construction activities.

**Exhibit 3.4:** Comparison of Agreements Executed and Agreements Pending by Region



## Completing Environmental Documents

We are committed to environmentally clearing the 500 miles of the Phase 1 system from San Francisco to Los Angeles/Anaheim, a key element to meeting our federal grant requirements. With the completion of the environmental reviews for the Bakersfield and Merced extensions, approximately 200 miles are now complete, with 119 miles in active construction. Staff are driving to complete all documents from San Francisco to Los Angeles over the next 24 months. This work is an important prerequisite to extend the system as additional funding is identified.

In November 2019, under our new National Environmental Policy Act (NEPA) Assignment authority, we issued the Record of Decision (ROD) for the segment between Shafter and Bakersfield in the Central Valley (known as the Locally Generated Alternative). This completed the environmental review process between Fresno and Bakersfield and allows us to begin pre-construction activities, such as advancing design, mapping right of way and identifying utilities to be relocated. This was the first environmental action taken under California's newly granted NEPA assignment.

The route extends from Poplar Avenue in Shafter east toward State Route 99 then southward into Bakersfield, ending at the F Street Station in downtown Bakersfield. This route was developed collaboratively with state, regional and local partners. On the way to finalizing the ROD, we held more than 100 stakeholder meetings, 17 additional public and technical working group meetings, and 15 monthly regulatory agency coordination meetings.

In September 2020, the Authority Board of Directors took final action on the ROD for the Final Supplemental Merced to Fresno Environmental Impact Report (EIR)/Environmental Impact

Statement (EIS). This completed the analysis of the Central Valley Wye that provides the junction for trains travelling north-south between Southern California and Merced, between Southern California northwest to San Francisco, and between Merced and San Francisco. With the completion of this document, we are now prepared to initiate advanced design activities north to Merced.

We have also been making significant strides toward completing the remaining environmental documents. In 2021, we will clear nearly 300 miles of the route from San Francisco to Los Angeles/Anaheim, including the first two sections reaching into Los Angeles County and the City of Los Angeles. We have identified preferred alignments from San Francisco to Los Angeles/Anaheim. This is an essential step on the way to publishing the draft environmental documents. In 2020, we published four of the remaining six draft environmental documents to the public for review and comment. Within the next year, we expect to release draft environmental documents for the final two project sections for public review and comment. **Exhibit 3.5** provides an overview of the environmental work that is completed and the progression of completion over the next two years.

In addition, as noted on **Exhibit 3.5**, Brightline West has completed environmental review of a high-speed rail line between Victorville, California, and Las Vegas, Nevada, and entered into an agreement with the California State Transportation Agency (CalSTA) and Caltrans to use existing highway right of way. Brightline, a private developer, operates a service between Miami and West Palm Beach, Florida. In January 2019, we joined CalSTA and Caltrans to collaborate with Brightline West, through a Memorandum of Understanding. The agreement outlines our intent to work together, share information and explore opportunities for joint procurements and interoperability on both systems.

**Exhibit 3.5:** Map of Environmental Status and Progress



**Table 3.1** summarizes the schedule for completing the remaining six project sections and shows when the final EIR/EIS documents and RODs are scheduled to be complete. It is important to note that these updated schedules incorporate known impacts due to the pandemic and additional new

environmental analysis due to new regulations. It is uncertain how the ongoing pandemic will affect future public and agency document reviews. The schedule in **Table 3.1** notes the impacts to our schedule for completing Records of Decision for each section, as we know them today.

**Table 3.1: Projected Environmental Schedules**

Project Section	Draft EIR/EIS	Projected ROD Date
Locally Generated Alternative (Fresno to Bakersfield)	Complete (November 2017)	Complete (October 2019)
Central Valley Wye (Merced to Fresno)	Complete (September 2019)	Complete (September 2020)
Bakersfield to Palmdale	Complete (February 2020)	Q2 2021
Burbank to Los Angeles	Complete (May 2020)	Q4 2021
San José to Merced	Complete (April 2020)	Q1 2022
San Francisco to San José	Complete (July 2020)	Q2 2022
Palmdale to Burbank	Q3 2021	Q4 2022
Los Angeles to Anaheim	Q4 2021 to Q1 2022	Q4 2022 to Q2 2023



**Photo:** Deputy Project Manager James Tung reviews project section maps with a citizen

## Major Upcoming Milestones

Having advanced much of the pre-construction and construction work in the Central Valley over the last two years, we are past the midpoint of construction on the original 119 miles. We have resolved long-standing issues with major stakeholders. Significant work that was required to open access along the railroad lines that our alignment follows has been completed, and the utility work necessary to allow construction to finish is defined and underway along the entire alignment.

We expect to achieve major milestones in 2021 on all construction packages. Most notably, we will achieve substantial completion of Construction Package 4 by spring 2022. This will allow for the Track and Systems contractor to have full access to begin work. In addition, our goals are to achieve the following by the end of 2021:

- Complete environment documents on 291 miles of the nearly 500 miles from San Francisco to Los Angeles;
- Deliver needed right-of-way parcels to the contractors to advance construction;
- Complete all critical land rights conveyances, and execute the remaining third-party agreements;
- Construction will be substantially complete or underway on 83 of the 93 structures (90 percent) and on 106 of 119 miles of guideway (90 percent);
- Construction Package 1: Clear remaining utility conflicts to allow existing construction to advance and move forward on the remaining 19 structures necessary to complete guideway construction; install Union Pacific Railroad bypass tracks at three major locations to allow heavy construction work along the alignment in Fresno at Ventura and Tulare Streets, the

Fresno Trench and at Herndon Avenue; increase daily on-site construction workers to 500;

- Construction Package 2-3: Complete nearly half (31 miles) of total guideway construction and clear the remainder for construction advancement without further delay; complete 17 structures and have all remaining structures under construction; increase daily on-site construction workers to 900;
- Construction Package 4: Increase daily on-site construction workers to 250 and complete all outstanding right of way and pre-construction to allow for unimpeded progress towards completion. This segment will be ready for track and systems work to begin in 2022; and
- Award the Track and Systems Contract and begin design to start construction in 2022.

**Table 3.2** shows our current assessment for completion of the three ongoing construction projects and when we expect to award the Track and Systems contract.

**Table 3.2: Central Valley Construction Schedule**

Construction Elements	Expected Completion
Construction Package 1	December 2023
Construction Package 2-3	December 2023
Construction Package 4	April 2022
Track and Systems Contract Award	August 2021

## BEGINNING TRACK AND SYSTEMS WORK IN 2022

The Track and Systems contract is necessary for the Authority to meet its federal funding agreements and to advance the development of high-speed rail consistent with the tenets of Proposition 1A (the Safe, Reliable High-Speed Passenger Train Bond Act for the 21st Century).

As civil construction nears completion in the Central Valley Segment, we are preparing for Track and Systems installation. This required initiating a procurement and developing a detailed understanding of project activities that affect the Track and Systems contractor work to apply previous lessons learned on the 119 miles of construction. Key to that understanding is having greater schedule certainty for the transfer of civil guideway sections from each construction package contractor to the Track and Systems contractor.

We released the Track and Systems request for proposals in December 2019, and two international joint-venture teams are preparing bid proposals, which are due in July 2021:

- Bombardier-Salcef-Weitz Consortium; and
- H-A-C Rail Partners (Hitachi, Acciona, Copasa).

The construction schedule in **Table 3.2** was provided to the proposers and will be the basis for their detailed delivery approach and schedule.

### ■ ADDRESSING RISKS

Due to COVID-19 impacts, both teams requested that the procurement schedule be extended. We are working with the two proposers on RFP amendments to help them navigate uncertainties

created by the pandemic. This also includes the proposers assessing how the COVID-19 marketplace is affecting them. In addition, conversations with the bidders highlighted their concerns related to the timing of civil infrastructure availability.

During public review of the Draft 2020 Business Plan, the Authority received comments from the California High-Speed Rail Peer Review Group (PRG), the Legislative Analyst's Office and members of the Legislature on the contract elements and timing. Specifically, some expressed concern about the contract size and risk associated with entering into a 30-year or longer contract which includes not just track and systems installation but also ongoing maintenance.

The contract is structured around a series of Notices to Proceed (NTP). This approach ensures that each step in the contract can only proceed when the Authority has the funding necessary to deliver it and the necessary prior work has been completed. Further, the Board of Directors and the State Public Works Board must approve each NTP. Essentially, the NTP structure and process provides a "risk check" to ensure that the contract is carefully managed and that there is consistency between the multiple NTPs.

This contract provides that a single contractor design, integrate, construct and maintain for 30 years the construction and interfaces between the train, the signal system and power system. The risks associated with the long-term nature of the contract are not fundamentally due to the maintenance provisions included in the contract. The primary risk is tied to making sure contract costs, including maintenance costs, are paid for

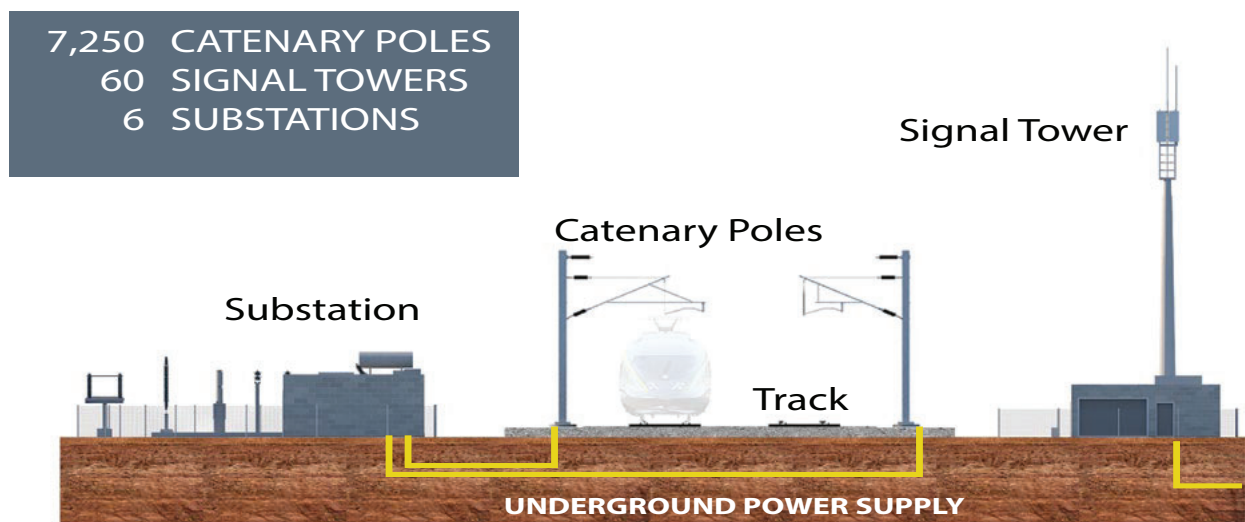
through necessary operating agreements with a service provider. To mitigate this risk, the PRG and others recommended that the Authority execute a Memorandum of Understanding (MOU) between the Authority and the proposed interim service operator prior to executing any Track and Systems contract. The Authority completed the MOU in 2020 and has performed additional research on the legality of future interim operations. This is discussed further in Chapter 4.

Once the contractor is on board, we will need to consider advancing the final major element—trainsets. Prototype trains will be required for

testing track, systems and electrification elements. High-speed rail development requires an integrated approach to design of all components together—track bed, track, electrification and communications between those elements and the train. A safe and reliable system needs to be designed and constructed together.

**Exhibit 3.6** shows the various components involved in the operation of an electrified train system. As early as July 2022, the first stages of site work and construction will begin on Construction Package 4.

#### **Exhibit 3.6:** Key Train/Infrastructure Integration





### EVALUATING A PHASED TRACK OPTION

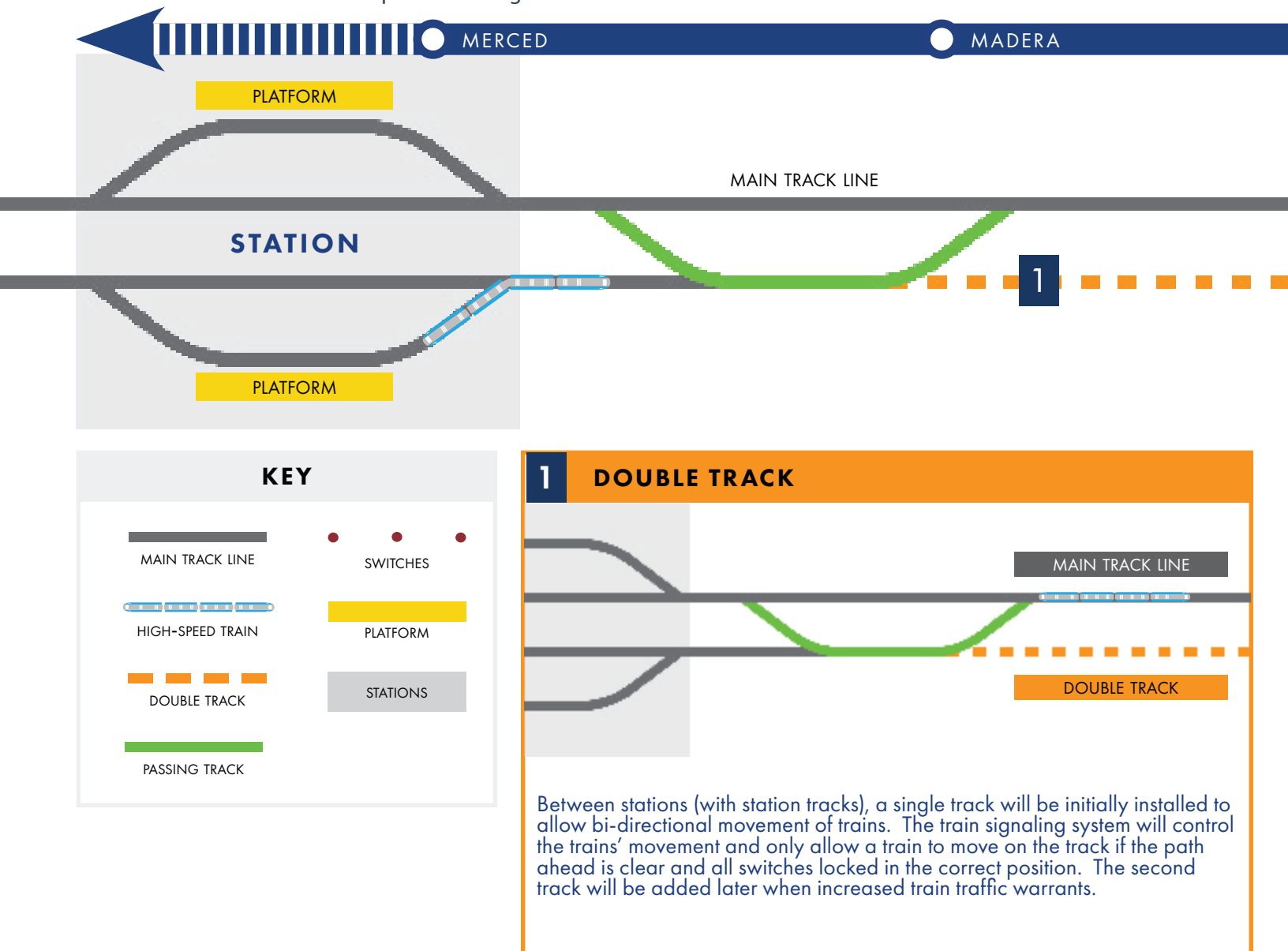
In an update since the February 2020 Draft Business Plan, we are incorporating an alternative phased track option within the NTP structure. We propose to evaluate this procurement strategy because it would allow flexibility to deliver track and systems in an incremental manner. This phased approach provides flexibility to manage and defer initial capital and maintenance costs, while maintaining a safe, 18 trains per direction per day operation. To further develop and evaluate this proposal, we have asked the Track and Systems bidders to submit bids that reflect two options: (1)

building two lines simultaneously, or (2) building them in two phases.

The single-track option, as shown in **Exhibit 3.7**, involves constructing a single, mainline track, and all track and systems necessary to test and certify the first U.S. high-speed train on the electrified 119-mile Central Valley Segment and then expanding it to Merced and Bakersfield, allowing for interim passenger service.

Key to this option is installing passing tracks at each station and/or at other key passing locations in order to achieve optimal safe passenger service,

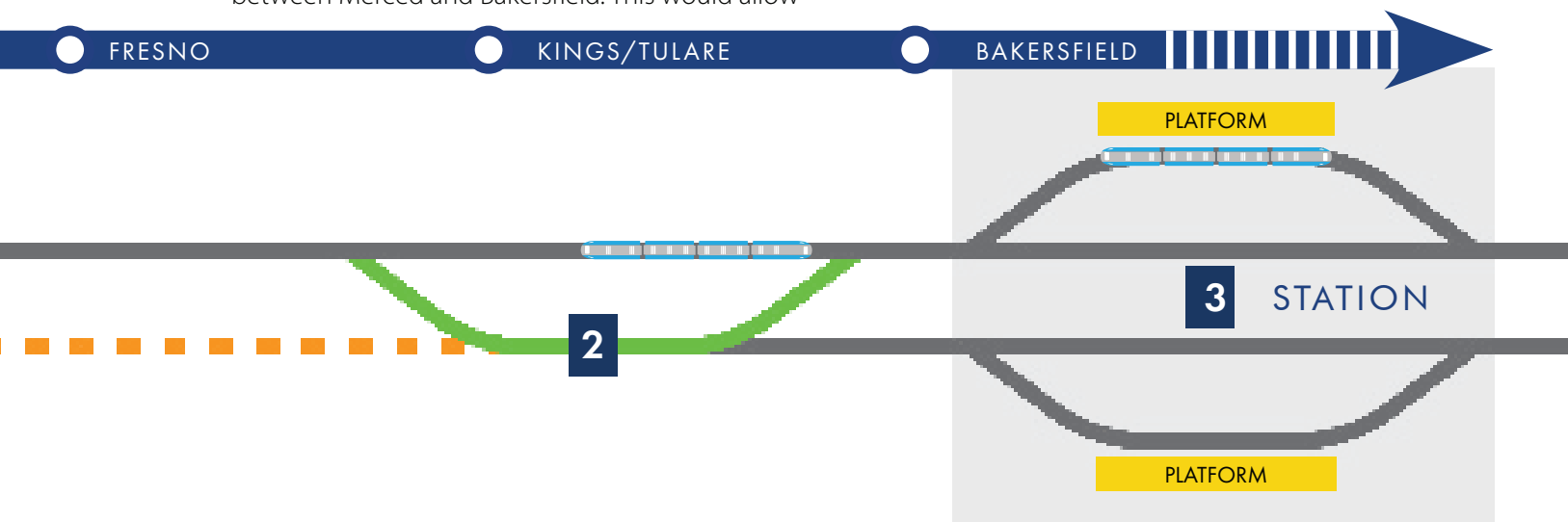
**Exhibit 3.7: Phased Track Operations Diagram**



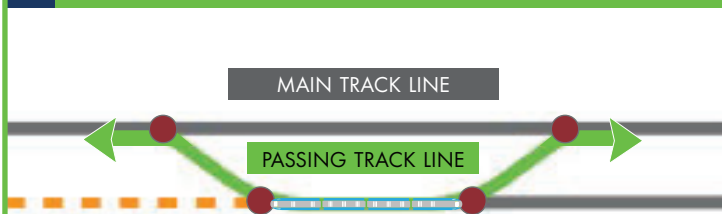
including travel time, connectivity and reliability. More specifically, unlike current diesel service in the Central Valley that operates on shared freight tracks, high-speed trains will not be delayed by waiting for other priority freight services to pass. In addition, track elements necessary for ultimate expanded dual-track operation would be constructed in order to minimize future service interruptions and costs.

Based on our initial analysis, we have concluded that starting with a single track is a viable option for testing and certifying the 119-mile Central Valley Segment, as well as for beginning interim service between Merced and Bakersfield. This would allow

the Authority to deliver an operational high-speed rail service to Central Valley destinations within cash flow and funding availability. Our intent is to further evaluate the track and systems phasing options with the bidders and conduct a thorough evaluation of trade-offs, both near and longer-term. This will include evaluating operational performance issues, capital costs, operations and maintenance costs, ridership and revenue. Our analysis will inform our recommendation to the Authority's Board of Directors prior to executing a Track and Systems contract.



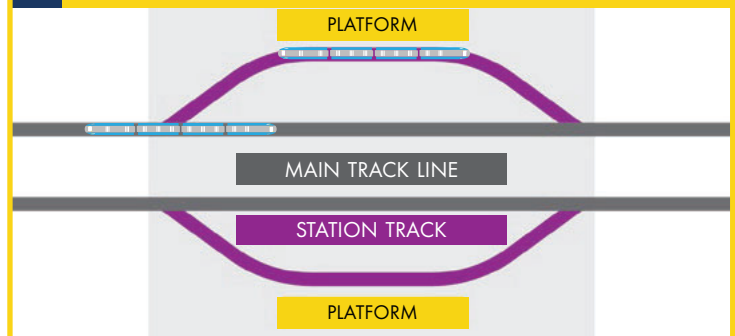
## 2 PASSING TRACK & SWITCHES



An interlocking is a collection of switches, trackwork, and signaling used to prevent conflicting train movements. Once the train route is set, and all switches belonging to the route are in the correct locked position, the train is given a signal to proceed. The route cannot be set if the presence of a conflicting train, a track defect, or an improperly positioned/unlocked switch.

Switches permit trains to move from one track to another. The switches are remotely operated by the train traffic control system, part of the signaling system. Each switch position is monitored, and each switch must be in the correct position for the selected route.

## 3 STATIONS



All trains stopping at the station will use the station track. Trains not stopping at the station will by-pass the station at average track speed using the mainline tracks.

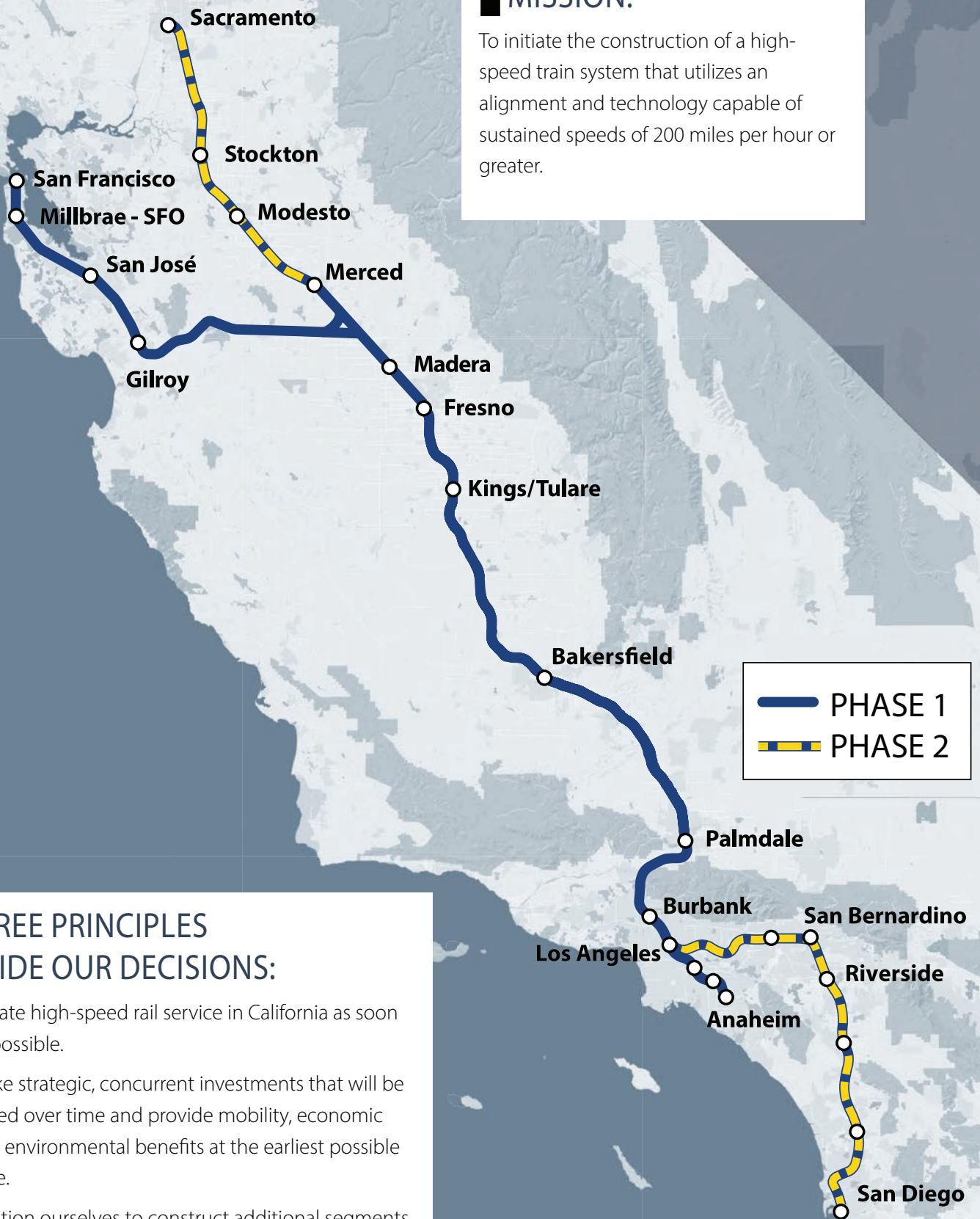
## MISSION:

To initiate the construction of a high-speed train system that utilizes an alignment and technology capable of sustained speeds of 200 miles per hour or greater.

— PHASE 1  
— PHASE 2

## THREE PRINCIPLES GUIDE OUR DECISIONS:

1. Initiate high-speed rail service in California as soon as possible.
2. Make strategic, concurrent investments that will be linked over time and provide mobility, economic and environmental benefits at the earliest possible time.
3. Position ourselves to construct additional segments as funding becomes available.





# EXPANDING THE SYSTEM: GETTING BEYOND THE FIRST 119 MILES

The primary challenge to delivering the full system is funding. This issue has been identified repeatedly as the primary barrier to advancing our work statewide by the California High-Speed Rail Peer Review Group, which was established by the Legislature. Sufficient funding to construct the entire system has never been provided to the Authority. Therefore, the Authority has adopted a pragmatic and reasoned approach to how it will advance toward our mission to complete the system. Two years ago, Lou Thompson, the Chair of the Peer Review Group, noted at a legislative hearing:

**“Simply put, we do not believe that it is fair or credible to ask management to deliver a long-term project of this size and complexity with sources of funding that are inadequate in total and unreliable in any given year.”**

Because we are progressing in a constrained funding environment, the Authority adopted three principles to guide our decisions on how to deliver California high-speed rail over time:

1. Initiate high-speed rail service in California as soon as possible.
2. Make strategic, concurrent investments that will be linked over time and provide mobility, economic and environmental benefits at the earliest possible time.
3. Position ourselves to construct additional segments as funding becomes available.

## CHAPTER 4

These priorities are consistent with how Proposition 1A was structured and the objectives underlying our federal grant agreements.

In February 2020, we laid out our proposed “building block” implementation strategy for how to invest currently available state and federal funding to advance our mission and meet our federal grant commitments. Central to it is delivering interim high-speed rail service between Merced and Bakersfield as soon as possible. The Peer Review Group and members of the Legislature raised questions about this proposal and suggested additional analyses to address their questions and concerns, which focused on:

- A peer review of the ridership forecasts;
- Developing an agreement clarifying roles and responsibilities for providing interim service; and
- Legal questions regarding our interim service business model as it relates to “no operating subsidy” provisions set forth in the Safe, Reliable High-Speed Passenger Train Bond Act for the 21<sup>st</sup> Century (Bond Act).

We were asked to evaluate these issues. We have done so and the results, which are presented in this chapter, reaffirm our belief that expanding on the investment we are currently making in the Central Valley is an appropriate next step for building out the system. Extending the Central Valley Segment

beyond the orchards and into the cities of Bakersfield and Merced is the right thing to do.

While the priorities we set out in February 2020 remain the same, the risk review we have conducted over the last year has caused us to recalibrate our approach, leading us to advance the program more cautiously and with a greater respect for risk.

The priorities we established have not fundamentally changed, but we are now proposing to give greater emphasis to advancing the full 500-mile system even as we build out the Central Valley so that they can be more construction-ready. Specifically, our priorities are:

- Complete construction of the 119-mile Central Valley Segment and lay track, fulfilling our federal grant agreements with the Federal Railroad Administration (FRA);
- Meet our federal commitment to environmentally clear the entire 500-mile system between San Francisco and Los Angeles/Anaheim;
- Advance construction on the “bookend” projects that we have committed funding to in the Los Angeles Basin and the Bay Area—projects valued at more than \$3 billion;
- Commence testing of the electrified high-speed system in 2025, certify trains by 2027, and put electrified high-speed trains in service by the end of the decade;
- Expand the 119-mile segment in the Central Valley to develop 171 miles of electrified high-speed rail service by advancing design, funding pre-construction work and constructing extensions to Merced and Bakersfield, connecting downtown Merced, Fresno and Bakersfield with additional stops at Madera and Kings/Tulare;

- Advance project design in each segment, including the four Southern California segments between Bakersfield and Anaheim and two Northern California segments between San Francisco and Merced, as each segment is environmentally cleared; and
- Pursue federal and private funds prospectively to “close the gaps” and expand electrified high-speed rail service to the Bay Area and Los Angeles/Anaheim, advancing the Phase 1 system approved by the voters in 2008.

## Advancing the Full 500-Mile High-Speed Rail System

Over the last several months, the Authority has worked to address comments and questions from members of the Legislature, the California High-Speed Rail Peer Review Group and stakeholders. These comments were directed at the Authority’s recommendation to develop interim high-speed rail service between Merced and Bakersfield along with two studies pertaining to that proposal which were prepared by the Authority’s Early Train Operator, DB Engineering & Consulting USA, and our financial advisor, KPMG.

For example, during an Assembly Transportation Committee in May 2020, some members of the Committee requested that a peer review be conducted of the Early Train Operator’s ridership study. We contracted with an independent review team comprised of Resource Systems Group and its subcontractor, LTK, to evaluate the reasonableness of the ridership model inputs and the conclusions of the ridership forecast prepared by the Early Train Operator (ETO). That independent review confirmed the reasonableness of the ETO’s ridership study, stating, “The ETO team’s ridership analysis is reasonable.”

The results, which are presented in this chapter, reaffirm our commitment to launching interim passenger service on a Merced to Bakersfield high-speed rail line. To further that goal, we propose to invest in more detailed engineering and design for the 33-mile Merced extension, the 19-mile Bakersfield extension and four stations in the Central Valley. This will enable us to develop definitive cost estimates for completing the interim system and prepare us to advance into construction.

At the same time, it is essential that we advance progress on delivering the full system between San Francisco and Los Angeles/Anaheim. Specifically, we propose to invest in more detailed engineering and design for project sections between Bakersfield and Anaheim and from Merced to San Francisco as these projects are environmentally cleared. This work is necessary to advance these segments of the Phase 1 system and to perfect project configuration, conduct geotechnical testing, map needed right of way, identify utility relocations and refine project costs. The Authority will advance this work as the segments complete the environmental review stage and the Board approves such investment.

## Early Interim Service in the Central Valley Makes Sense

The Central Valley is home to approximately 6 million residents and is becoming more prominent as the state's third regional economic engine. Fresno and Bakersfield, two of the 10 most populated cities in California, have experienced 20-percent population growth since 2000. The Authority is making a significant capital investment in the Valley, building 119 miles of high-speed rail infrastructure, running directly through downtown Fresno. The northern terminus is at the Madera Amtrak Station, which is in a remote location, and the southern terminus is Poplar Avenue, which is located in an orchard.

While the 119-mile Central Valley Segment will serve as the nation's first high-speed rail test track, it does not make sense to stop building there. It does make sense to extend it into the heart of Merced and into downtown Bakersfield.

**“The approach adopted by the [Authority] - what we could call “the building block approach” is very similar to the one used in Spain that has ultimately led to the development of the largest high-speed rail network in Europe, second largest high-speed rail network in the world after China.”**

*— Xiana Margarida Mendez Bertolo,  
Secretary of State for Trade, Ministry of Industry,  
Trade and Tourism, Spanish Government*



This will move the end points “out of the orchards and into the cities” where there are new and growing businesses, colleges and universities, medical centers and connections to other

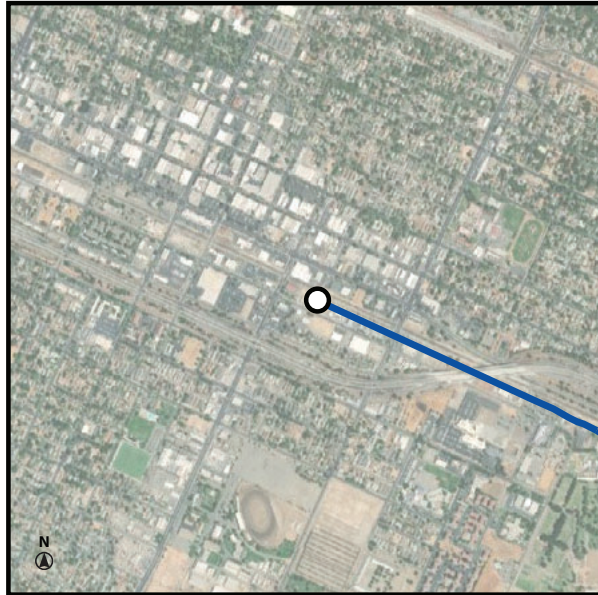
passenger rail and bus services to points north, west and south of the Central Valley. **Exhibits 4.0 and 4.1** illustrate this choice.

**Exhibit 4.0: Comparison of Madera vs Merced Termini**

**MADERA STATION (IN RURAL AREA)**



**STATION IN DOWNTOWN MERCED**



**Exhibit 4.1: Comparison of Poplar Avenue vs Bakersfield Termini**

**POPLAR AVENUE (NO STATION; IN RURAL AREA)**



**STATION IN DOWNTOWN BAKERSFIELD**



**LEGEND**

— High-Speed Rail Alignment

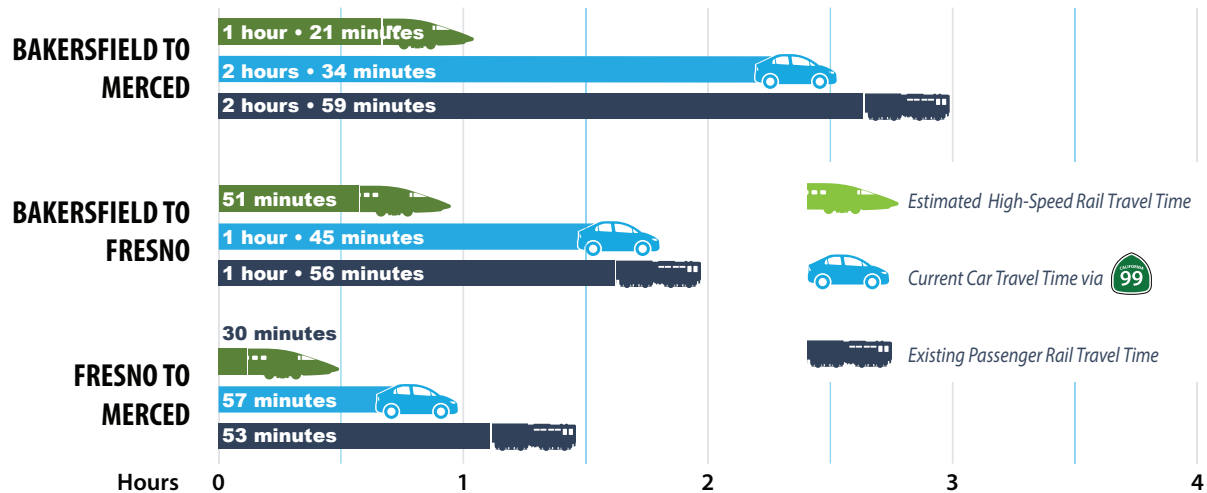


○ High-Speed Rail Stations

Today, the 171-mile trip from Merced to Bakersfield takes 2.5 hours by car and approximately 3 hours by intercity passenger rail (with only seven roundtrips per day). Introducing high-speed rail

service in that corridor will cut that travel time in half, as shown in **Exhibit 4.2**, and will include more frequent service.

**Exhibit 4.2: High-Speed Rail Cuts Central Valley Travel Times in Half**



\*All travel times are approximate. Trips are measured from central business district, existing passenger rail stations, or planned high-speed rail stations. Approximate car travel times were estimated based on the California Statewide Travel Demand Model. Existing passenger rail travel times were approximated using the Amtrak website, referencing schedules current as of publication. High-speed rail travel times were estimated by the Authority using internal modeling, which includes at least 5% padded time. Run times do not take into account integration with other operators' services in blended sections.

This initial operating line will:

- Reduce travel time along the corridor by 90 to 100 minutes;
- Improve operational reliability on this dedicated, passenger-only rail line, which will allow faster, more frequent, on-time service;
- Improve access and connectivity to other California destinations through better connections to the Bay Area and Sacramento with Altamont Corridor Express (ACE) and San Joaquins services in the north and connections with Thruway Bus Service at Bakersfield for travel to Southern California;
- Create the backbone of the high-speed rail system; and
- Demonstrate the value of high-speed rail service.

Delivering more frequent and faster service on an electrified high-speed rail line with improved connections and more convenient transfers to expanded regional services will improve travel not just for Central Valley residents, but for all Californians. The Merced to Bakersfield line will begin building the market for high-speed rail in California.

### INITIAL STUDIES TO EVALUATE INTERIM SERVICE

Our 2018 Business Plan first introduced the concept of initiating early high-speed passenger service in the Central Valley as a first building block of California high-speed rail. Over the last two years, we have conducted a series of studies to develop and assess the merits of this approach and to address a range of questions raised by our Board of Directors, the California High-Speed Rail Peer Review Group, members of the Legislature and other stakeholders. The results of these studies

have confirmed our conclusion that expanding the Central Valley line to Merced and Bakersfield, as an interim operating segment, still makes sense.

Consistent with our principle for investing our available funds, we tasked the Early Train Operator with studying the potential ridership, revenue and operation of an interim service on two different lines, one between Merced and Bakersfield in the Central Valley and the other between San Francisco's 4th and King Station and Gilroy on the Peninsula.

The Early Train Operator's review concluded that there would be "significant value in interim high-speed rail services" between Merced and Bakersfield when connected to the existing state passenger rail network. This spine would connect seamlessly at Merced to existing passenger services north to Sacramento and east to the Bay Area via the San Joaquins and Altamont Corridor Express (ACE); and south at Bakersfield to existing San Joaquins Thruway Bus connections into the Los Angeles Basin. The Early Train Operator's study showed that electrified high-speed rail service on dedicated tracks would significantly reduce travel times through the Central Valley, allow for faster and more frequent service, generate significantly higher ridership, reduce the state's passenger rail subsidy requirements and reduce greenhouse gas (GHG) emissions.

Based on the Early Train Operator's conclusions, we made a policy recommendation in our 2019 Project Update Report to expand construction in the Central Valley and develop the 171-mile line connecting Merced to Bakersfield.

After the release of our 2019 Project Update Report, the Board of Directors requested two additional studies:

- **Business Case Assessment Study:** The Board's Finance and Audit Committee requested that our financial advisor, KPMG, develop a Business Case Assessment Study for the proposed Merced to Bakersfield interim high-speed rail service. The study, conducted in 2019 and published February 2020, evaluated a range of issues, including funding and affordability, ridership and revenue forecasts, the potential business model, commercial considerations, risk and mitigation strategies, and socioeconomic and other benefits; and the
- **Side-by-Side Study, Quantitative Report:** The Board of Directors requested that the ETO prepare an expanded analysis comparing the Merced to Bakersfield investment recommendation to other comparable early investment options in the San Francisco to Gilroy corridor and the Burbank to Anaheim corridor. The Side-by-Side Study, Quantitative Report, conducted in 2019 and published February 2020, evaluated a range of costs and benefits, including capital and operating costs, ridership, GHG reductions and congestion relief.

Together, these two studies, along with their recommendations, affirmed our proposal to invest in developing the Merced to Bakersfield line for interim service. Because they were completed in 2019, some conditions have changed since they were first published.

## KPMG BUSINESS CASE ASSESSMENT STUDY

KPMG concluded that the line connecting Merced and Bakersfield allows the Authority to meet one of its key objectives—initiating high-speed rail service as soon as possible. The study presented 10 conclusions and five recommendations which are summarized below.

## BUSINESS CASE ASSESSMENT - CONCLUSIONS

KPMG's conclusions are summarized below:

1. **Merced to Bakersfield interim service will generate significant socioeconomic benefits.** The study reviewed the Authority's analysis that implementing the capital program is projected to generate \$37.9 billion in total economic activity and 203,000 job-years of employment.<sup>5</sup> Other benefits noted relate to safety, noise, improved travel times, reduced GHG emissions and congestion relief. KPMG agreed the interim service will stimulate significant benefit for the Central Valley.
2. **These investments will enhance mobility and create a multimodal hub at Merced.** KPMG concluded that interim service would have a major impact on existing mobility and rail travel between Silicon Valley and the Central Valley, based on the ETO's forecast of corridor-wide ridership increasing from 2.6 million passengers in 2017 to 8.8 million passengers in 2029.
3. **Interim service allows the Authority's assets to be used, mitigating the risk that they will be unutilized.** Rather than sitting idle, the high-speed rail infrastructure investment can be used to run high-speed passenger service and begin generating benefits.
4. **Interim service reduces the State's costs for passenger rail operations in the corridor.** The ETO's updated revenue and operating and maintenance costs forecasts estimate a reduction in the State's costs for passenger rail operations in this corridor by approximately \$25.5 million to \$41.0 million in 2029 (in 2019\$) for Central Valley service.
5. **At the time the Business Case Assessment was conducted in 2019, KPMG concluded that the Merced to Bakersfield Interim Service system was affordable under a base case scenario and depended on funding and cost estimates to remain stable.**<sup>6</sup> Based on the Authority's recent risk assessment that was conducted in 2020, including funding sources, and the intent to refine the capital cost estimates for the Merced and Bakersfield extensions through advancing design, the affordability of the Merced to Bakersfield segment will be further reevaluated.
6. **As part of a future Silicon Valley to Central Valley line, adding Merced yields a positive return on investment.** KPMG evaluated the incremental capital cost for the Merced extension against the net revenues associated with it. After taking into account the incremental capital cost, the estimated overall return on investment is \$0.5 billion to \$0.9 billion.
7. **Interim service requires a new business model.** An interim service business model would position the Authority as an infrastructure owner that would lease its high-speed rail infrastructure to an operator to cover operating and maintenance costs. These costs would be determined through the long-term Track and Systems and Trainsets contracts.
8. **Interim service plans require additional investments from state and regional partners.** The extension of ACE to Merced and construction of a cross-platform connection between high-speed rail services and both San Joaquins and the ACE services in Merced will require additional investments over and above the approximately \$1 billion



that the San Joaquin Joint Powers Authority (SJJPA) and San Joaquin Regional Rail Commission (SJRRRC) have already secured from state, federal and local funds.

**9. Upcoming long-term contracts for Track and Systems and Trainsets will have implications for interim service.**

Because these two contracts will each include long-term and complex provisions on performance levels, service plans and other terms, the interim service operator will need to conform to the terms of these two contracts.

**10. Delineation of capital program delivery risks and interim service risks.**

Risks associated with delivering interim service fall into these two categories. The study noted that the capital program for delivering Merced to Bakersfield, bookend projects and system-wide planning are multiple megaprojects which exist regardless of whether interim service is implemented. Interim service risks are risks associated with implementing operations and can take the form of Authority risks, shared risks or risks owned by other parties.

## **BUSINESS CASE ASSESSMENT - RECOMMENDATIONS**

The Business Case Assessment Study recommendations for advancing interim service are:

**1. Implement interim service to unlock mobility benefits and to fund infrastructure maintenance.**

Interim service unlocks the socioeconomic benefits associated with high-speed rail passenger service, described above, prior to the completion of the Silicon Valley to Central

Valley Line. Further, it reduces risks associated with unutilized assets sitting idle in the Central Valley prior to expanding the system to the Silicon Valley. Interim service could also provide a dedicated funding source to maintain the Authority's infrastructure assets in a state of good repair and meet long-term contractual obligations.

**2. Pursue an interagency agreement with other agencies.**

The study recommends that the Authority secure a sufficient level of commitment, through a Memorandum of Understanding, from regional partners and the California State Transportation Agency (CalSTA) before making major long-term commitments and operating decisions for interim service.

**3. Secure funding streams to complete capital program.**

KPMG recommends that the Authority take steps to secure the remaining Proposition 1A construction funds at the appropriate time (estimated in FY21/22) to complete the capital program for Merced to Bakersfield interim service and reduce uncertainty related to affordability. Further, KPMG recommends that the Authority work with key stakeholders and partner agencies to gain stakeholder consensus to increase the certainty of securing funding.

**4. Preparatory work is required before executing Track and Systems and Trainsets contracts.**

The KPMG study recommends that the Authority should ensure stakeholders are committed to interim service before additional major contracts are executed and that the Track and Systems contract include flexibility to comply with the minimum scope of the

federal grant requirements. Civil works contracts should also be fully aligned with the Track and Systems contracts and all right of way should be acquired for the 119-mile high-speed test track.

#### **5. Advance extensions to Bakersfield and Merced incrementally by segment.**

These extensions could be undertaken if certain milestones are achieved or risks are mitigated, including achieving the Record of Decision (ROD) for the Central Valley Wye, determining affordability based on bids, securing access to funding and settling FY10 funding risks.

### **BUSINESS CASE ASSESSMENT - INTERIM SERVICE RISK MITIGATION STRATEGY**

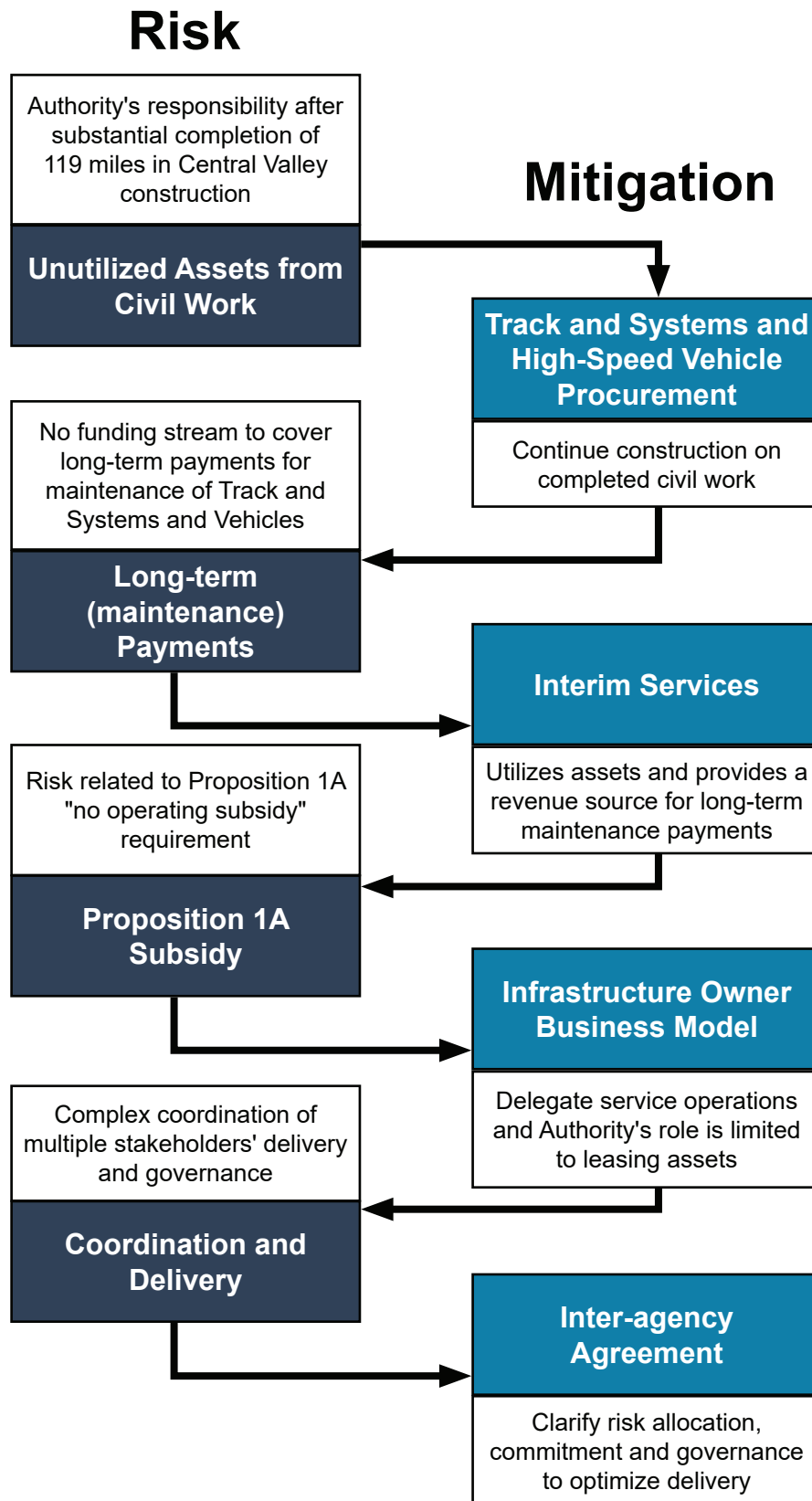
KPMG identified a range of both risks and benefits associated with interim service between Merced and Bakersfield and laid out a series of risks and related risk mitigations, which are illustrated in **Exhibit 4.3**. KPMG noted that, after the 119 miles of civil works in the Central Valley are completed, the Authority will be responsible for the maintenance and security of these assets. The Authority's plan to procure Track and Systems and Trainsets contracts is to mitigate the risk of unused assets. Both contracts are to be structured to construct these assets in phases and so that the contractors maintain the assets for 30 years.

Comments made by the California High-Speed Rail Peer Review Group, the Legislative Analyst's Office and members of the Legislature have re-emphasized KPMG's recommendation that agreement(s) with agencies responsible for

operations be completed prior to entering into these long-term operations and maintenance contracts. As discussed below, the Authority has worked with the SJJPA/SJRRRC and CalSTA to enter into a Memorandum of Understanding setting out the parties' roles and responsibilities and next steps before entering into a Track and Systems contract. This agreement was developed and signed by all parties in November/December 2020. To view the Memorandum of Understanding, visit the Authority's website at [https://hsr.ca.gov/docs/brdmeetings/2021/brdmtg\\_012121\\_Item4\\_Interim\\_Service\\_Plan\\_MOU\\_SJJPA.pdf](https://hsr.ca.gov/docs/brdmeetings/2021/brdmtg_012121_Item4_Interim_Service_Plan_MOU_SJJPA.pdf).

Interim service would provide a mechanism to pay for the long-term maintenance costs associated with these assets. Further, interim service could provide the state with the socioeconomic benefits associated with high-speed passenger service. KPMG suggested that, for the duration of interim service, the Authority limit its role to being only an infrastructure provider by leasing its rail assets and delegating interim service operations. This recommendation is essential so that the Authority may adopt an interim service business model, described in more detail below.

**Exhibit 4.3:** Interim Service Risk Mitigation

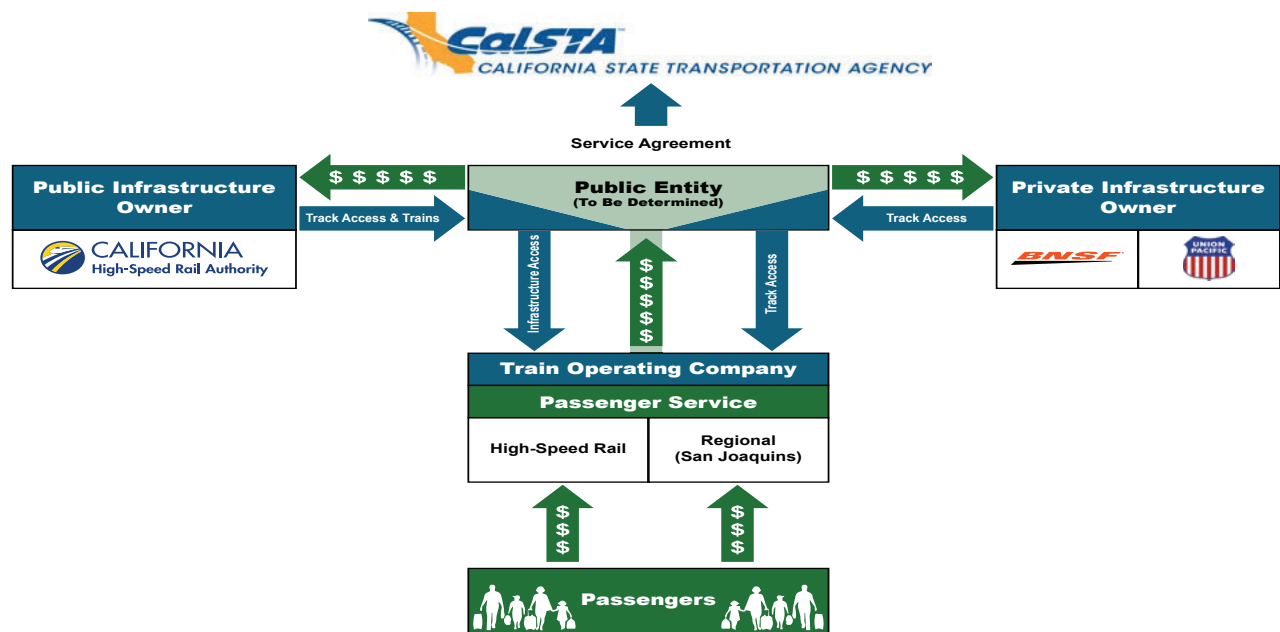


**BUSINESS CASE ASSESSMENT - INTERIM  
SERVICE BUSINESS MODEL**

In prior business plans, the Authority has laid out a business model which defines roles and responsibilities for high-speed rail passenger operations. In its Business Case Assessment, KPMG recommended that the Authority consider a separate business model for interim service.

The proposed business model, shown in **Exhibit 4.4**, would follow an “infrastructure owner” approach where the Merced to Bakersfield capital infrastructure would be utilized by a separate public entity until the Authority completes the Silicon Valley to Central Valley line.

**Exhibit 4.4:** Merced to Bakersfield Interim Service Business Model



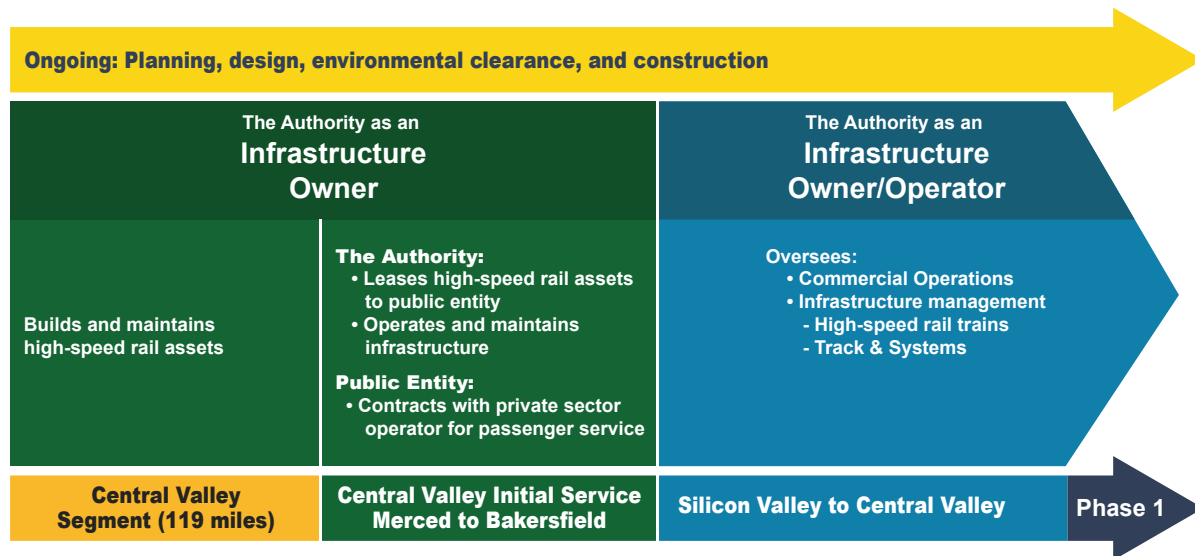


The Authority's role will evolve over time and once the system has been extended to the Silicon Valley to Central Valley line, the Authority's role will evolve from the interim service business model to the long-term infrastructure owner/operator business

model as laid out in previous business plans. This evolution is illustrated in **Exhibit 4.5**.

To view the KPMG Study, visit [https://hsr.ca.gov/docs/about/business\\_plans/2020\\_Business\\_Plan\\_Business\\_Case\\_Assessment\\_Study.pdf](https://hsr.ca.gov/docs/about/business_plans/2020_Business_Plan_Business_Case_Assessment_Study.pdf)

**Exhibit 4.5:** Evolution of California High-Speed Rail Responsibilities Through Time



## EARLY TRAIN OPERATOR SIDE-BY-SIDE STUDY

The Side-by-Side Study compared the recommended high-speed rail investment between Bakersfield and Merced to other potential early investment options in the San Francisco to Gilroy corridor and the Burbank to Anaheim corridor. The Side-by-Side Study concluded that the high-speed rail investment in the Central Valley corridor provides the highest benefits, requires the least additional system investment and reduces, rather than increases, the operating subsidy of the system, including regional rail operators. The Northern California and Southern California corridors require considerable additional regional investments, whereas the Merced to Bakersfield corridor requires only up to \$500 million in

additional regional funding to achieve significantly greater benefits.

The Side-by-Side Study compared the results of a similar level of high-speed rail investment in each corridor by evaluating key factors, such as ridership, revenue and passenger miles traveled, and resulting reductions in vehicles, vehicle miles traveled and air quality emissions.

The Early Train Operator assessed the existing conditions in each corridor, then evaluated regional improvement plans and both the funding available and the funding that would be required to improve regional services utilizing the high-speed rail investment through a series of scenarios. The funded regional investment was used as a baseline to compare the results of adding high-

speed rail infrastructure and service in each corridor. **Table 4.0** shows the evaluation criteria used and the results of the analysis.

For this analysis, the Early Train Operator used the State Rail Plan model. This model provided greater detail related to existing and projected ridership on regional services, such as Altamont Corridor Express, San Joaquins, Metrolink and Caltrain. The model offered several advantages in providing forecasts for the shorter segment side-by-side analysis:

- The model has been calibrated and validated by CalSTA/Caltrans against actual observed ridership data from existing service providers;
- It provides ridership information for specific shorter segments, including Merced to Bakersfield, San Joaquins, ACE, Caltrain and Metrolink services, as part of the State Rail Plan <https://dot.ca.gov/programs/rail-and-mass-transportation/california-state-rail-plan>; and
- It has been used by the State of California to analyze and run strategic planning and funding scenarios for State budgeting purposes to identify revenue and operating costs.

**Table 4.0: Early Train Operator Side-by-Side Comparison, Summary of Quantitative Findings\***

Evaluation Criteria	Northern California Peninsula Corridor	Central Valley Corridor	Southern California Burbank to Anaheim Corridor
<b>Corridor Statistics</b>			
Length of Corridor (in miles)	77	171	44
Highest Speed Attainable (in mph)	110	220	125
<b>Service Results</b>			
Ridership Increase (in millions)	1.9	4.8	2.5
Revenue Increase (\$ in millions)	25.9	117.2	30.0
Additional Annual Passenger Miles Traveled (in millions)	91	340	108
<b>Congestion Relief</b>			
Annual Vehicle Miles Traveled Reduction (in millions of miles)	75.7	283.6	90.0
Annual Vehicle Reduction (in thousands)**	4.5	21.0	6.7
<b>Air Quality Benefits</b>			
Greenhouse Gas Emissions Reduction (in thousands of metric tons of CO <sub>2</sub> )	36.8	50.6	19.3
<b>Schedule Horizon</b>			
High-Speed Rail Operation Within 10 Years	Possible	Yes	Unlikely

\*Comparison between Funded Regional Investments (Scenario 2) and High-Speed Rail Investment (Scenario 4)

\*\*Assumes average mileage per car of 13,476 miles per year

**Early Train Operator Central Valley Corridor**

**Summary Findings:**

- Attains the highest speed: designed for speeds up to 220 miles per hour (modeled in this analysis to operate at 185 miles per hour);
- Generates the largest ridership increase: 4.8 million additional system-wide annual riders;
- Yields the highest revenue increase: \$117.2 million in additional system revenues from passenger fares;
- Provides the most congestion relief: a reduction of 284 million annual vehicle miles traveled (VMT); and
- Reduces 50,000 more metric tons in GHG emissions: compared to the no-build scenario.

These benefits primarily result from the ability to implement electrified high-speed rail service along a longer corridor, doubling the frequency of service in the entire system and leading to the greatest amount of travel time savings for passengers.

**Table 4.1** shows the funding necessary to achieve these results. As the Side-by-Side Study shows, in the Central Valley, the construction of a longer high-speed rail line with significant travel time reductions (90 to 100 minutes) and increased service frequency attracts new ridership. The travel time savings delivered by a faster service attracts new riders from

a larger geographical area connected to the state rail system.

The Side-by-Side Study concluded that significant additional regional investments in the Burbank to Anaheim and San Francisco to Gilroy corridors, the majority of which are not currently funded, would be necessary to yield comparable benefits to the Merced to Bakersfield corridor. Finally, it also noted that only the Central Valley option with high-speed rail operation showed an improvement in the fare revenue to operating cost ratio compared to current operations.

**EARLY TRAIN OPERATOR MERCED TO BAKERSFIELD CONCLUSIONS**

- Faster, more frequent and more reliable passenger service than is currently available, reducing the travel time between Bakersfield and Merced by 90 to 100 minutes;
- Partnerships with other operators enhance connectivity to other passenger rail services in Merced, where there is a commitment of nearly \$1 billion to bring the ACE and San Joaquins services to connect with high-speed rail;
- Faster service and greater connectivity provide the highest ridership potential and fare revenue of any other investment option, resulting in a lower State operating subsidy;

**Table 4.1: Early Train Operator Side-by-Side Comparison, Capital Costs (\$YOE in Billions)\***

Capital Cost Requirements	Northern California Peninsula Corridor	Central Valley Corridor	Southern California Burbank to Anaheim Corridor
Regional Funding Committed	2.3	1.0	1.8
<b>Funding Required</b>			
Additional Regional Funding Required	17.1	0.5	7.0
Additional High-Speed Rail Funding Required	5.3	4.8*	7.0
<b>Total Additional Funding Required</b>	<b>22.4</b>	<b>5.3</b>	<b>14.0</b>

\*This capital cost estimate has been updated in Chapter 5 of this 2020 Business Plan.

- Central Valley air quality is improved by significant reductions in Vehicle Miles Traveled due to higher ridership system wide, which results in the highest reduction in total system roadway vehicle emissions, and by shifting from diesel to electrified high-speed trains between Merced and Bakersfield; and
- It allows assets constructed for high-speed rail to be used for early testing and electrified, high-speed operations.

To view the ETO's Study, visit [https://hsr.ca.gov/docs/about/business\\_plans/2020\\_Business\\_Plan\\_Side\\_by\\_Side\\_Study\\_Quantitative\\_Report.pdf](https://hsr.ca.gov/docs/about/business_plans/2020_Business_Plan_Side_by_Side_Study_Quantitative_Report.pdf)

**“With major new infrastructure clearly visible in nearly all parts of the Central Valley, a transformative mobility option is within our reach.**

**The completion of the first high-speed rail operating segment between Bakersfield and Merced provides connections to established rail connections in ACE and the San Joaquin Services, as well as a far-reaching statewide bus network. By virtue of its central location, the high-speed trains will dramatically improve travel options between southern and northern California and between the Central Valley and the urban centers of Sacramento, San José and Oakland/San Francisco.”**

**— Stacey Mortensen**  
*Executive Director, San Joaquin Regional Rail Commission*

#### **Early Train Operator Updated Ridership Forecast for Merced to Bakersfield:**

In keeping with its responsibilities of overseeing the Authority's ridership forecasts, the Early Train Operator prepared an updated Central Valley corridor forecast for the Draft 2020 Business Plan. The updated forecast projects 8.8 million annual system-wide riders in the corridor in 2029, compared to 4 million annual riders under a 2029 No Build Scenario (no high-speed rail investment in the corridor)—a doubling of system-wide rail ridership. For more information on this updated analysis, see the Central Valley Segment System Management & Operations Interim Financial Plan at: [https://hsr.ca.gov/docs/about/business\\_plans/2020\\_Business\\_Plan\\_CV\\_Segment\\_System\\_Mgmt\\_Operations\\_Interim\\_Fin\\_plan.pdf](https://hsr.ca.gov/docs/about/business_plans/2020_Business_Plan_CV_Segment_System_Mgmt_Operations_Interim_Fin_plan.pdf)



## Responding to Comments and Legislative Requests

During the public review of the February 2020 Draft Business Plan, the Authority received comments from the public, stakeholders, members of the Legislature, and the California High-Speed Rail Peer Review Group (PRG). These comments are welcome and valued, and over the last several months, we worked to address several of their questions. This section summarizes that additional work, which consisted of:

- Conducting an independent comparative analysis of the ridership forecasts presented in the Early Train Operator's Side-by-Side Study to confirm that the assumptions and results are valid;
- Completing a Memorandum of Understanding with the California State Transportation Agency (CalSTA) and the San Joaquin Joint Powers Authority (SJJPA) to assure concurrence with the Authority's concept for interim service between Merced and Bakersfield; and
- Providing a legal assessment of the proposed interim service business model as it relates to Proposition 1A.

### INDEPENDENT REVIEW OF THE SIDE-BY-SIDE STUDY

The results of the Early Train Operator's Side-by-Side Study were presented in the Draft 2020 Business Plan first issued for public comment in February 2020. In response to requests by members of the Legislature, the Authority contracted with an independent review team comprised of Resource Systems Group and its sub-contractor LTK to conduct a peer review of the Early Train Operator's earlier ridership study. The team was asked to evaluate the reasonableness of the ridership

model inputs and conclusions. After its review, the Resource Systems Group concluded that:

**"...the ETO Team's ridership analysis is reasonable. While the ridership forecasts used in the Side-by-Side Study are high-level and meant for corridor comparison purposes, they were made and used appropriately to help understand which corridor obtained the most ridership increase, among other benefits. Moreover, the assumptions and benefits were fair and assigned correctly."**

The review team found "no fatal flaws" with the modeling work done by the Early Train Operator and that its work applied the model appropriately. The Resource Systems Group concluded that the ridership estimates are within expected and published elasticity ranges for travel time and frequency, albeit somewhat high in the Burbank to Anaheim corridor. They also confirmed that the Merced to Bakersfield corridor, which includes high-speed rail service in that corridor and improvements in supporting Altamont Corridor Express (ACE) and San Joaquins rail and bus services, obtains the highest forecast gain in ridership and does so at the lowest increase in cost, relative to a "no build" scenario.

As proposed in the Draft 2020 Business Plan, issued in February 2020, the Merced to Bakersfield corridor would transition from the current level of service (operated by Amtrak) running on tracks shared with freight railroads to an hourly high-speed service running on an exclusive 171-mile high-speed rail corridor. The corridor would be part of a network of high-speed rail, ACE and San Joaquins trains, as well as connecting Thruway buses. On the southern end of the corridor, the Thruway buses connecting at Bakersfield would also have increased frequency and would be extended to more Southern California destinations. ACE service

would increase from weekday-only to seven days per week. These service increases, along with the opening of the first truly high-speed rail corridor in the nation, represent a major paradigm shift for the Central Valley, providing faster rail service and better connections to more destinations (see “The Importance of Well-Timed Transfers”).

The analysis highlights that these changes present an opportunity. Travel speeds between Bakersfield and Merced will increase significantly, reducing travel times in the corridor. This will also affect trips to points north and west, including intercity markets such as Bakersfield to Sacramento, Fresno to Sacramento, Bakersfield to Oakland, and Fresno to Oakland. In addition, increased frequency of service will also contribute to higher ridership.

While there is a risk that potential riders will choose to use automobiles and not change their travel behaviors, reducing the projected financial benefits, the risk in the Merced to Bakersfield corridor is lower when compared to the San Francisco to Gilroy and the Burbank to Anaheim corridors. Both the San Francisco to Gilroy and Burbank to Anaheim corridors have higher costs, as well as lower forecast ridership and revenue increases according to the analysis.

Risk identified the connecting transportation services expected in the Merced to Bakersfield “build” scenario appears to be relatively low compared to the other two corridors given the lesser need for additional regional funding in the Merced to Bakersfield “build” scenario relative to the other corridors. Over the last several months, the Authority worked with the relevant partners and signed a Memorandum of Understanding to mitigate this potential risk in December 2020.

**“Merced to Bakersfield HSR Interim Service with intermediate stops at Madera, Fresno, and Kings/Tulare will provide tremendous economic growth, sustainable development opportunities, and substantial environmental benefits in a region that has a history of being vastly overlooked.”**

– Dan Leavitt  
Manager of Regional Initiatives  
San Joaquin Regional Rail Commission/  
San Joaquin Joint Powers Authority

#### **Review of Ridership Side-By-Side Study Demand Model**

The review team gauged the reaction of the ridership demand model to changes in inputs, such as travel times, fares and frequency.

The main conclusion of the analysis is that the ridership model is generally producing results within the expected range and, since it was applied consistently across all three corridors, the ridership forecasts in the Side-by-Side Study are reasonable, especially for a high-level (planning level) forecast.

The review team confirmed the critical question of this peer review: Was the ridership analysis done reasonably? The answer is, “Yes.” More specifically, the team:

- Focused on whether the ridership forecasts were reasonable, whether the ridership benefits assigned were correctly allocated, and whether the model inputs and assumptions were correctly defined and fairly applied across all three corridors. The answer is again, “Yes.” The assumptions and benefits were fair and were assigned correctly.
- Analyzed the revenues and found them to be reasonable as well and recognized that introducing high-speed rail would create a significant change in the Merced to Bakersfield corridor’s transportation system.
- Reviewed the more incremental changes in the San Francisco to Gilroy and Burbank to Anaheim corridors and analyzed those in depth. Although the report focuses on the Merced to Bakersfield corridor, the review team confirmed the ridership forecasts were sound for the San Francisco to Gilroy and Burbank to Anaheim corridors as well. Although the Burbank to Anaheim corridor forecasts appear slightly high, overall, the review team found that the forecasts look reasonable.
- Reviewed the methodology and other information used by the Early Train Operator to develop the Burbank to Anaheim corridor operations and maintenance (O&M) costs and the assumptions used to develop those costs. This review was undertaken only for the service in the Burbank to Anaheim corridor

to provide more clarity on costs due to the lack of detailed, publicly available information on operations and maintenance costs for the proposed service improvements, as compared to the Central Valley or the Northern California San Francisco to Gilroy services, where information was available and provided to the Early Train Operator.

Because these costs reflect the preponderance of overall costs required to deliver service, the study presents an optimistic assessment of the financial feasibility of high-speed rail service in that corridor. It is unlikely that service could be delivered for the costs cited in the Side-by-Side Study, despite overall network operating efficiency improvements as richer levels of service are operated in the future. A more likely outcome is higher operating costs than are predicted in the study, requiring higher-than-predicted public operating subsidies to sustain the Southern California service.

For more information on the Resource Systems Group’s evaluation, see the Side-by-Side Peer Review Report at [https://hsr.ca.gov/docs/about/business\\_plans/2020\\_Business\\_Plan\\_CHSRA\\_Side-by-Side\\_Peer\\_Review\\_Report.pdf](https://hsr.ca.gov/docs/about/business_plans/2020_Business_Plan_CHSRA_Side-by-Side_Peer_Review_Report.pdf).

### The Importance of Well-Timed Transfers

The ridership increase projected for the Merced to Bakersfield high-speed rail line reflects the faster travel time and more frequent service that will be offered plus the enhanced connectivity that is being planned. Better connections will be made through coordinating capital investments and service plans to provide easy transfers to Altamont Corridor Express (ACE) regional service and the San Joaquins intercity line.

Some stakeholders questioned whether people would ride on the Merced to Bakersfield line if they must transfer at Bakersfield or Merced to travel to other destinations beyond those end points. Notably, the ridership forecast prepared by the Early Train Operator already accounts for transfers through a “transfer penalty” that is included in the modeling. Making sure that those transfers are easy and convenient is key, and the Authority, CalSTA and the SJJPA are committed to working together to provide “timed transfers” to ensure that passengers will not experience long wait times between connections. We are also working together to plan stations so passengers can easily walk between trains and buses.

Easy transfers are essential to all modern public transportation systems. Throughout the world, major metro areas offer local and regional services with good connections to intercity passenger rail systems at key stations. Not every trip can be a one-seat ride, so fast, reliable connections are provided to allow travelers to easily complete their journey with one or even two transfers. We frequently experience this when we fly, where feeder services provide connections to longer-distance routes at major hub airports, such as SFO in the Bay Area or LAX in Los Angeles.

In the San Francisco Bay Area, Caltrain surveyed its passengers about transfers and found that 32 percent of Caltrain riders made at least one transfer to another system. In a similar survey in Southern California, 57 percent of all Metrolink riders transfer to another rail or bus line at Union Station to complete their journey. In 2018, close to 400,000 of the 1 million riders that traveled on the San Joaquins service also used the connecting Thruway buses to and from Southern California.

California high-speed rail will be the backbone of California’s modern, integrated public transportation system. Travelers making longer distance trips between cities will be able to make easy connections at multimodal stations, providing seamless, door-to-door connectivity.





## MEMORANDUM OF UNDERSTANDING FOR INTERIM SERVICE BETWEEN MERCED AND BAKERSFIELD

In its July 2020 letter to the Authority, the Peer Review Group commented that the 2020 Business Plan should include additional information on a Memorandum of Understanding to be developed to address the Authority's interim service plan. Specifically, the Peer Review Group recommended that the Authority develop an agreement or memorandum of understanding that provided for an:

**“Agreement or memorandum of understanding with the potential lessees at an appropriate level of detail on the operating plan and support responsibility for the leased line along with re-analysis of any impacts on demand and operating forecasts resulting from the full operating plans and schedules. The agreements should establish which agencies would bear the responsibility for covering all of HSRA’s [the High-Speed Rail Authority] costs and holding it harmless in the event that capital costs or subsidies are larger than projected by the Early Train Operator.”**

Authority leadership and staff worked with state and regional entities, including CalSTA and the San Joaquin Joint Powers Authority (SJJPA), throughout the summer and fall of 2020 to draft the Memorandum of Understanding. The purpose of the Memorandum of Understanding is to facilitate cooperation and coordination to develop the requirements of early interim operation to integrate that new service with existing intercity and regional rail systems.

The Memorandum of Understanding was approved by the Governing Board of the SJJPA in November and signed by Authority CEO Brian Kelly and Secretary of CalSTA David Kim in December.

It is an overarching agreement that sets forth roles and responsibilities and how the parties will work together to reach agreement on specific areas for service implementation. Of note, the agreement addresses the issue of how operating and maintenance costs will be covered for interim high-speed rail service between Merced and Bakersfield. Specifically, it states that:

**“SJJPA will pay CHSRA (the Authority) a System Access Fee for usage of CHSRA infrastructure and related assets in an amount sufficient to cover the portion of CHSRA’s maintenance and overhead costs that are related to the Interim Service. SJJPA will use incremental farebox revenues generated from increased ridership to make these CHSRA payments, and also to pay the Operator engaged by SJJPA.”**

The agreement also outlines those elements to be resolved and included in subsequent, more detailed and specific agreement(s) that will amend, supplement or supersede the Memorandum of Understanding, including:

- A system access agreement;
- A train lease agreement; and
- An operations agreement with the SJJPA operator of initial service (including Authority operating guidelines and requirements).

This agreement now creates the basis for further cooperative planning among the three parties. To view the Memorandum of Understanding, visit the Authority’s website at [https://hsr.ca.gov/docs/brdmeetings/2021/brdmtg\\_012121\\_Item4\\_Interim\\_Service\\_Plan\\_MOU\\_SJJPA.pdf](https://hsr.ca.gov/docs/brdmeetings/2021/brdmtg_012121_Item4_Interim_Service_Plan_MOU_SJJPA.pdf)

The Memorandum of Understanding also fulfills a recommendation from KPMG’s Business Case Assessment Study which advised the Authority that, in addition to the Memorandum of

Understanding, several subsequent agreements will be necessary over time to implement interim service and high-speed passenger rail operations. The agreements will cover a range of comprehensive and very specific issues, including:

- Coordinated implementation timelines and milestones;
- Funding agreements;
- Station development;
- Service plans; and
- Infrastructure lease agreements.

### **INTERIM SERVICE BUSINESS MODEL AND PROPOSITION 1A**

During the public comment period on the Draft 2020 Business Plan, questions were raised about the relationship of the Authority's interim service business model for high-speed rail passenger service between Merced and Bakersfield and Proposition 1A's requirements.

"Interim Service" would allow an entity, other than the Authority, to lease equipment and run electrified high-speed rail service between Merced and Bakersfield using the Authority's system. This service would begin from the time when the system is able to transport passengers until the segment between the Silicon Valley to the Central Valley is fully operational. The Interim Service would then transition to an "Authority Operated Service."

In legislative hearings on the Draft 2020 Business Plan that were held in May, some legislators and members of the public asked whether the Authority's proposed interim service business model violates the "no operating subsidy" provisions of the funding plan requirements set forth in the 2008 Safe, Reliable High-Speed Passenger Train Bond Act for the 21st Century

(Bond Act). After carefully reviewing the Bond Act's language, court decisions and the Public Utilities Code, the Authority has concluded that the interim service business model is legally permissible.

The interim service as contemplated in the business model complies with the Bond Act's restrictions while allowing Californians to access clean, electrified high-speed rail trains sooner than otherwise possible. While the Bond Act precludes an operating subsidy paid by or to the Authority, under the Authority's model, not only will it not pay or receive an operating subsidy, it will also significantly reduce the current state subsidies paid to rail transit service in the area. The interim service business model is fully consistent with the purpose and intent of the Bond Act because it will cost the State less than it is currently spending on subsidies for conventional passenger rail service. The purpose of the Bond Act's "no subsidy" provisions is to protect taxpayers' dollars by requiring the Authority to plan a system that would not need perpetual state funding to meet operating expenses.

The interim service business model will save the State money while placing the billions of dollars in taxpayer investments in fast and clean transportation into use as soon as possible. The State is currently subsidizing conventional passenger rail service in the Central Valley. The proposed interim service business model, with increased service frequency and speed generating higher revenue, is expected to save the State approximately \$40 million per year. This allows the State to use those resources to improve rail services in other parts of California. This interim service business plan allows the benefits of clean, electrified high-speed rail service to enter into the Central Valley earlier than otherwise possible.

The Bond Act restrictions on operating subsidies apply only to service provided by the Authority or “pursuant to” its authority. The interim service model will not be provided by the Authority or pursuant to its authority, and, therefore, the “no subsidy” requirement of the Bond Act is inapplicable. The Authority will structure the agreement with the third-party entity as a lease of real property and equipment and will have neither control over the lessee’s high-speed rail operations nor financial responsibility for operating and maintenance costs or any losses (as explained and illustrated in the discussion of interim service on in Chapter 3).

The interim service model also complies with Public Utilities Code Section 185032, which places exclusive authority over the high-speed rail system with the Authority. Section 185032 was enacted to give the Authority sole and exclusive authority among state agencies. It does not preclude the provision of high-speed rail service by a non-State actor under an arrangement in which the Authority exercises no control over its operation and assumes no liability for its costs.

### **LEGISLATIVE CONSIDERATIONS – INTERIM SERVICE BUSINESS MODEL**

The Authority believes the provision of early interim services is fully consistent with Proposition 1A and other statutory requirements, and on a practical level, the approach is consistent with how high-speed rail systems around the world are implemented.

The Authority also recognizes statutory clarification can mitigate legal risk and notes the Legislature adopted Assembly Bill 1889 in 2016 (Mullin, 2016) to clarify the eligibility of Proposition 1A investments in the San José to San Francisco segment and Los Angeles to Anaheim segment.

The Legislature may clarify a bond act without submitting an amendment to the voters, so long as the change is not so significant as to constitute a repeal or partial repeal of the Bond Act (*Veterans of Foreign Wars v. State of California* (1974) 36 Cal. App.3d 688, 693-694).

As AB 1889 clarified requirements for usable segments, statutory clarification around operating subsidy requirements and provisions related to what entities can provide high-speed rail service in California could prove beneficial to mitigate legal risk in these areas, and in doing so facilitate the ability of the State to work in partnership with the San Joaquin Joint Powers Authority to provide zero-emission high-speed rail service at the earliest possible timeframe.

It is important to note that the proposal to commence an interim high-speed rail service between Merced and Bakersfield is primarily intended to put constructed assets costing billions of dollars to use and to provide high-speed rail service in California at the earliest possible time. These same assets that will allow a regional operator to provide regional electrified high-speed service will also be used for the one-seat, full Phase I system operated by the Authority as extensions to the Bay Area and Southern California are constructed.

### **THESE STUDIES AND REVIEWS AFFIRM OUR MERCED TO BAKERSFIELD RECOMMENDATION**

The three reviews discussed above, along with the prior KPMG and ETO studies, validate the Authority’s recommendation to advance the Merced to Bakersfield corridor as the first building block for interim high-speed rail service on our path to building the entirety of the San Francisco to Anaheim system. This is a realistic and pragmatic

approach to continuing to expand outward from current construction in the Central Valley.

This approach allows us to build on the federal and state investments and the commitments made to Central Valley communities and to put these infrastructure assets to work as soon as possible to improve mobility and demonstrate the benefits of high-speed rail. This approach is consistent with our guiding principle to initiate and begin delivering the benefits of high-speed rail service as soon as possible and with the objectives for early service contemplated in our federal grant agreements.

**“High-speed rail is much more than a train project. It’s about economic transformation and unlocking the enormous potential of the Valley.”**

— Governor Gavin Newsom

In addition to these reviews, over the last year we have completed risk analyses in response to the pandemic to further gauge how and when Merced to Bakersfield service can be delivered. Our risk review has clarified that further work is needed to advance design to better understand the risks, refine our cost estimates and evaluate the optimal way to fund and deliver it. That is what we propose to do.

## Implementation Plan to Advance Statewide System

Our proposed implementation plan will move the statewide system forward on two fronts.

- First, finish the construction underway in the Central Valley and fund advanced design work on the Merced and Bakersfield extensions to

develop an initial 171-mile high-speed rail line between Merced, Fresno and Bakersfield. This will include geotechnical work, right-of-way mapping, identifying utility relocations and other pre-construction activities. Following design work completion, the Central Valley extensions to Merced and Bakersfield will be ready to proceed into construction. As summarized in Chapter 3, we propose to begin with a single-track approach for the Central Valley Segment. We would continue with single-track for the full 171-mile Merced to Bakersfield line.

- Second, advancing design, geotechnical work, right-of-way mapping and other activities on the rest of the system after project sections are environmentally cleared—specifically, the two project sections between San Francisco and Merced and four sections between Bakersfield and Anaheim.

This work will move every mile of the system forward to be better positioned for securing additional funding for construction.

## MOVING FORWARD WITH MERCED TO BAKERSFIELD

Our near-term plan is to advance design on the Merced and Bakersfield extensions and move them closer to being ready for construction. Both extensions are already environmentally cleared. In 2021, we will procure a contractor to take the design of each extension through advanced preliminary design, specifically to approximately the 30 percent to 40 percent design level. We anticipate that design work on both the Bakersfield and Merced extensions will take approximately two years to complete, at the end of which the alignment will be fully configured and each extension would be ready to advance into pre-construction activities.



Conducting advanced preliminary engineering will involve carrying out geotechnical investigations, beginning the environmental permitting process, identifying what utilities need to be relocated, beginning third-party agreements with railroads, utilities and local jurisdictions and fully mapping the right of way that needs to be acquired for construction. Through this process, we will be able to better define project risks and create more certainty on costs.

We will also carry the four Central Valley station projects (Merced, Fresno, Kings/Tulare and Bakersfield) into advanced design. Design work on the Madera Station will be managed by the San Joaquin Joint Powers Authority. The Authority's work will include continuing concept site plan work which will prepare for the design of the station sites and will inform the procurement of a station site designer. The scope of that work will include site investigation and analysis, preliminary and schematic design, and design development. The steps following that will include preparing construction documents and seeking regulatory approvals, leading to procurement documents ready for bid. Throughout the process, cost estimates will be refined with increasing levels of detail.

As described in Chapter 3, the Authority is procuring a Track and Systems contractor. To mitigate risks affecting our Track and Systems procurement, we have evaluated a phased approach to installing the track and systems in the Central Valley. These actions would mitigate cost risks and could improve construction efficiency. This phasing option would still allow the same level of speed and frequency of service assumed by the Early Train Operator in its ridership and revenue forecasts. Under a phased approach, the contractor would initially install systems and single-track on the 119-mile Central Valley Segment, which will

function as a test track, and then on the Merced and Bakersfield extensions. The Authority intends to further evaluate this option as informed by the Track and Systems bids which are due in July 2021.

As we proceed, we will evaluate design and implementation options to maximize efficiency and use of available funding, with the focus on getting zero-emission high-speed rail up and running at the earliest opportunity. This will include working with CalSTA and the San Joaquin Joint Powers Authority to explore these options, which include sequencing options and value engineering to match expenditures to the timing and level of available revenues. This approach is also consistent with the KPMG Business Case Recommendation Number 5 (summarized earlier in this chapter) which noted cost risk and suggested phasing Merced and Bakersfield extensions as necessary to address cost issues.

As part of this effort, the Authority will work with CalSTA and the San Joaquin Joint Powers Authority to explore interim trainset procurement or lease options that could provide the higher interim service speeds (estimated at up to 186 miles per hour) but at a lower cost through use of existing production trainsets or a lease approach. Under this scenario, as the system expands beyond Merced and Bakersfield, the Authority would then procure trainsets capable of operating at speeds of 220 miles per hour.

Additionally, certain end-point grade separations could be phased to reduce initial costs as trains slow to enter stations. The use of this phasing may not be necessary, but it will be refined to mitigate risks as funding is secured for construction of the Bakersfield and Merced extensions.

Advancing design allows the Authority to continue coordinating with Central Valley communities, stakeholders and service providers, on what the

Authority proposes to build and where. In turn, this helps to better define community improvements and rail-to-rail connections with high-speed rail investments. Our collaboration with the San Joaquin Joint Powers Authority and CalSTA will focus on developing integrated services and connections between state rail systems, including projects such as the Valley Link project that will provide increased connectivity between ACE service from Merced and BART, to connections with Thruway Bus services in Bakersfield. Advancing Central Valley station designs will support continued planning with the cities on zoning to encourage vibrant development around the stations and planning connections to other modes.

After design has been advanced, the Authority will be in a position to advance the Merced and Bakersfield extensions into the pre-construction phase. This would involve obtaining environmental permits, acquiring right-of-way, advanced works (including utility relocations) and completing all third-party agreements—all of which are critical path activities prior to construction.

An example of this is the relocation of the Golden Empire Transit (GET) Facility in Bakersfield to accommodate construction of the Bakersfield F Street station. This long-lead right-of-way purchase and relocation will require a large parcel to accommodate the construction of a new transit maintenance and storage yard. Relocation of this facility early will allow the transit agency to implement planned upgrades and address future regional bus service needs and ensure that the area is available for high-speed rail construction.

Once pre-construction work is complete, these two sections would be positioned to advance into construction.

## ADVANCING DESIGN IN NORTHERN AND SOUTHERN CALIFORNIA

Three corridors—in Southern and Northern California—involve complex tunneling and make up nearly 80 percent of the total estimated cost of the remaining 500-mile system beyond the 171-mile Merced to Bakersfield line. We have made good progress toward environmentally clearing the four Southern California sections between Bakersfield and Anaheim and the two Northern California sections between San Francisco and Merced. Once they are environmentally cleared, we propose to advance engineering and design in these corridors. This will involve geotechnical investigations, right-of-way mapping, identifying utility relocations and other work to configure these sections. As we do, we will incorporate value engineering and other methods to refine and potentially reduce the costs of these corridors.

In Southern California, the remaining segments stretch from Bakersfield to Los Angeles and Anaheim and involve tunneling, construction through urban areas, shared corridors with other rail systems, multimodal stations and airport connections, such as Los Angeles Union Station and the Hollywood Burbank Airport Station.

Similarly, in Northern California, the remaining high-speed rail segments stretch from Madera in the Central Valley to Gilroy, San José and San Francisco. These segments also involve tunneling, traveling through dense urban areas, shared rail corridors and multimodal stations, such as Diridon Station in San José and Salesforce Transit Center in downtown San Francisco.

These complex corridors require advanced design to better understand the engineering and construction issues, the risks and the potential costs. As we advance the design work, we intend to seek out appropriate expertise and to develop strategies to drive potential cost reductions on

these corridors. These corridors involve building new crossings over and through mountain ranges, including the Tehachapi Mountains between Bakersfield and Palmdale and the Pacheco Pass between the Bay Area and the Central Valley. How we build through those crossings will do more to determine the cost of the full system than any other components. Because of that, we will focus on pursuing the following strategies:

### **ADVANCING DESIGN AND GEOTECHNICAL WORK TO REDUCE UNCERTAINTY**

After achieving Records of Decision in the Northern and Southern California sections, we will be in a position to advance design to 30 percent, which will include mapping right of way, identifying utility relocations, conducting the necessary geotechnical investigations to develop geotechnical baseline reports and developing value engineering options to reduce costs. Once that design work is complete, these sections will be positioned to advance into the pre-construction phase when funding is available.

### **INDEPENDENT COST REVIEWS**

Concurrent with advancing design, the Authority will enlist broader peer reviews to confirm our cost estimates as they are refined through design, geotechnical borings, right-of-way mapping, risk assessments and other related activities. The focus of these reviews will be to inform the Authority's cost estimates. We will use this peer-reviewed work to update future cost estimates in subsequent reports to the Legislature.

### **MAXIMIZING EFFICIENCY**

Through independent review, new technologies, and by doing the work to advance the design and geotechnical studies, we will focus our efforts on maximizing efficiency in the sections that represent the majority of the Phase 1 system's remaining unfunded sections.

These efforts will be systematic, thorough and transparent to ensure that our costs are credible and that our assumptions are in line with current industry practices and supported by the information on these mountain crossings. This work is essential to ensure that project advancement is done efficiently and with great care for the stewardship of program funds.

### **ADVANCING DESIGN TO LEVERAGE ADDITIONAL INVESTMENT**

As we have seen already, the state's investment in high-speed rail can be used as matching funds to pursue additional federal investment in the program—in the Central Valley, in the Bay Area and in the Los Angeles Basin. Advancing design also creates the potential to partner on joint or coordinated funding requests, to leverage investments in shared corridors and to expand benefits more broadly beyond just high-speed rail. For example, the Caltrain corridor electrification project between San Francisco and San José is being jointly funded with federal, state and regional dollars. The same is true for the rebuild of the Los Angeles Union Station, where the Authority's investment of \$441 million has helped leverage other state, local and federal funds for the billion-dollar Phase 1 element of that project. There is strong interest in creating a major connection between California high-speed rail and Brightline West service to Las Vegas in Palmdale and, by advancing design, we may create opportunities for joint investments and funding there as well.

By advancing our design statewide, including in shared corridors in Northern and Southern California, we can further develop the integrated statewide system through a building block approach.

## Progress in Northern and Southern California

The Authority continues to invest in projects in Northern and Southern California that will provide near-term regional mobility benefits and lay the foundation for high-speed rail service. In collaboration with regional stakeholders, funding agreements have been completed for the following projects:

- \$714 million for construction for the Caltrain Peninsula Corridor Electrification Project;
- \$84 million for the San Mateo Grade Separation Project;
- \$18 million for the environmental review of the Link Union Station (Link US) Project;
- \$423 million for the Link US Phase A run-through track and station improvements; and
- \$77 million for the Rosecrans/Marquardt Grade Separation Project.

The Authority also works closely with freight railroads in the state. A well-defined and collaborative relationship between the Authority and the freight railroads in California is critical to the successful implementation of the high-speed rail program. There are two major freight railroads with operations within California; Union Pacific Railroad (UPRR) and the BNSF Railway Company (BNSF). The UPRR and the BNSF separately own, operate, maintain and dispatch a significant network of freight rail routes that also host both intercity and commuter passenger rail service. Both the UPRR and BNSF operate on their own right-of-way and under agreement on rights of way owned by public entities.

It is important to emphasize that both UPRR and BNSF play vital roles in the national and statewide economy by maintaining and expanding their ability to move freight by rail, to serve the state's ports and other shippers, and to help relieve the state's crowded highway network. Over the last several years, the Authority has reached fundamental agreements with UPRR and BNSF that are necessary for construction.

### NORTHERN CALIFORNIA PROJECT PROGRESS

In Northern California, elements of the high-speed rail system are at various stages of development thanks to strong partnerships that the Authority has made with local entities. Each element is essential to completing the Silicon Valley to Central Valley Line.

#### CALTRAIN ELECTRIFICATION PROGRESS

The Authority committed \$714 million to Caltrain's Peninsula Corridor Electrification Project, nearly 40 percent of the total \$2 billion cost. The project will electrify and upgrade the current Caltrain corridor, improving performance, operating efficiency, capacity, safety and reliability between San Francisco and San José.

An electrified Caltrain corridor is a critical element for bringing high-speed rail services to the Bay Area. It will enable high-speed trains to reach San Francisco by sharing tracks with Caltrain. This investment will increase Caltrain service, reduce emissions by 97 percent from today's diesel service, and allow passengers to experience what new electric trains can mean for travel up and down the Peninsula.



Today, poles and electrical wires to support electrified train service are currently being installed along the 51-mile segment. This year, Caltrain will receive the first Electric Multiple Unit trains for the corridor.

As we advance design in the Bay Area, we will continue to coordinate with Caltrain and other corridor owners and users to ensure that our investments are aligned with their plans and services.

### **SAN MATEO 25TH AVENUE GRADE SEPARATION PROJECT**

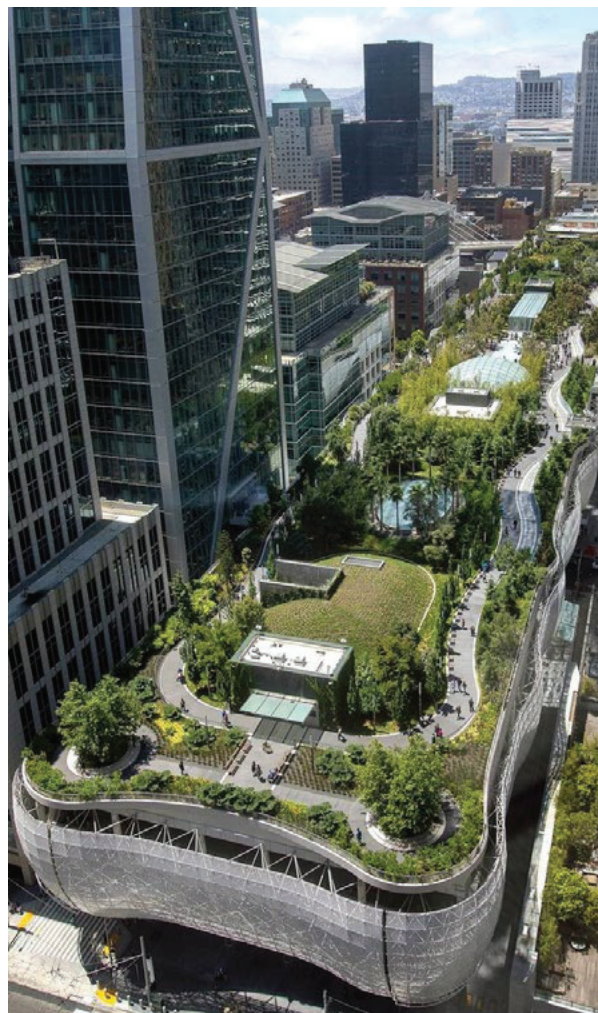
We partnered with the City of San Mateo, San Mateo County, Caltrain and others to construct the 25th Avenue Grade Separation, a project which ranked sixth on the California Public Utilities Commission's priority rail crossing safety list. In addition to reducing congestion and improving safety, the project will build a new elevated Caltrain Hillsdale Station with updated amenities at E. 28th Avenue. This will create space necessary for future passing tracks, should they be necessary.

The \$180 million project, managed by Caltrain, will raise tracks, lower E. 25th Avenue, and create new grade separated east-west connections at 28th and 31st avenues. We are contributing up to \$84 million toward project construction and serving in an oversight role on the project. All track relocation work and the grade separations are complete and station upgrades are underway. The project is expected to be complete this year.

### **SALESFORCE TRANSIT CENTER**

The northern terminus of the high-speed rail system, the Salesforce Transit Center, opened in 2018. The transit center includes a train box at the basement level where both high-speed rail and Caltrain trains will arrive. The underground facilities were funded by \$400 million in federal American Recovery and Reinvestment Act funds. This project was managed by the Transbay Joint Powers Authority (TJPA), of which the Authority is a member. Bus operations, park facilities on the roof and, soon, a substantial retail presence will make the transit center a marquee destination in San Francisco ([Exhibit 4.6](#)).

**Exhibit 4.6:** Photo of Salesforce Transit Center



## **DOWNTOWN EXTENSION PROJECT**

The Downtown Extension Project (DTX) will connect the existing rail network from 4th and King (in San Francisco) into the Salesforce Transit Center. This will allow both Caltrain and high-speed rail trains to access the transit center.

This project reached an important milestone in 2019—approval of the Supplemental EIR/EIS for the 1.3-mile tunnel project. Additionally, the San Francisco County Transportation Authority led an effort in 2019 to review the governance and project delivery approach for DTX and recommended that a multi-agency team (including the Authority) be established to help oversee the continued development of the project. In April 2020, the Authority executed a Memorandum of Understanding with five other agencies involved in the DTX project to establish the multi-agency team. The goal is to prepare the DTX project for construction as soon as possible.

## **PLANNING FOR DIRIDON STATION IN SAN JOSÉ**

Over the past two years, the Santa Clara Valley Transportation Authority, the City of San José, Caltrain, the Metropolitan Transportation Commission and the Authority have worked to develop the first phase of the Diridon Integrated Station Concept (DISC)—a shared vision for the future layout of the station as an intermodal hub that integrates with the surrounding community and supports the growth anticipated in Google's Downtown West plan.

DISC envisions the gradual transformation of the station area from one that is predominantly auto-oriented to a transit-oriented, world-class multimodal transit hub and gateway to Silicon Valley. The planning effort seeks to leverage billions of dollars spent on transit systems and connectivity to maximize transit ridership, reduce

auto dependence, create travel choice and attract investment. The partner agencies developed a unified vision for the spatial layout of the station and have worked on surrounding land use plans to ensure integration of rail infrastructure with surrounding communities. The next phases of work will include developing a cohesive strategy for investment at the station and the broader station area.

## **SOUTHERN CALIFORNIA PROJECT PROGRESS**

The last few years have been focused on completing environmental documentation on several projects in Southern California and, in 2021, the first construction is about to begin. The Rosecrans/Marquardt grade separation project is finalizing pre-construction work and is poised to break ground in 2021. The Link Union Station project will be selecting a preferred alternative and releasing a Draft EIR/EIS on this extensive rail access and station upgrade project. In addition, the Palmdale City Council voted in December 2020 to move forward with plans guiding future development around the proposed high-speed rail station in downtown Palmdale. The action caps a four-year planning and community engagement effort, funded in part by station area planning funds from the Authority.

## **ROSECRANS/MARQUARDT GRADE SEPARATION PROJECT**

The Authority is providing \$76.7 million in Proposition 1A funds for the Rosecrans/Marquardt Grade Separation Project shown in [Exhibit 4.7](#). The Rosecrans Avenue and Marquardt Avenue intersection was once rated as one of the most hazardous grade crossings in California by the California Public Utilities Commission. Los Angeles County Metropolitan Transportation Authority (Metro), the lead agency on the project, estimates

that more than 112 trains and more than 45,000 vehicles use the crossing daily.

The Federal Railroad Administration approved the Finding of No Significant Impact for the Rosecrans/Marquardt project in November 2018. Metro is completing final design, acquiring right of way and working closely with Southern California Edison on

advancing utility relocations to clear the way for construction. Construction is scheduled to begin in 2021 and to be complete by 2023. Watch the Authority's video about the Rosecrans-Marquardt Grade Separation project at <https://youtu.be/ugsdkvHd610>.

#### **Exhibit 4.7: Rosecrans/Marquardt Grade Separation Project Rendering**



#### **LOS ANGELES UNION STATION – LINK UNION STATION (LINK US) PROJECT**

Our partnership with Metro is key to implementing high-speed rail improvements in Southern California. The Link Union Station (Link US) Project involves extensive track and station upgrades to Los Angeles Union Station (LAUS) in downtown Los Angeles. The upgrades will transform access for regional services as well as modernize the station into a world-class facility.

The Authority has contributed \$18 million towards the environmental review and is responsible for the

NEPA review of the project under the Authority's federal NEPA Assignment responsibilities. In this role, the Authority has supported Metro in conducting additional scoping during Fall 2020 and provides federal review and oversight, working closely with Metro to advance the environmental impact statement.

The partnership has reached several major milestones over the last year, including completing a Memorandum of Understanding in September 2019 and the Authority's Board of Directors approving the Link US Funding Plan in April 2020. This vital step establishes the Authority's



commitment to provide an additional \$423 million in Proposition 1A bookend funds toward construction of Phase A at an estimated cost of \$950 million.

The Link US project will transform how the regional rail system operates in Southern California by allowing trains to enter and exit the station from both the existing northern tracks and new run-through tracks to the south over U.S. Highway 101, as shown in **Exhibit 4.8**. The project is anticipated to significantly increase capacity for rail service while reducing train idling times. Improvements will accommodate future high-speed rail service, with new run-through tracks dedicated to high-speed trains heading south toward Anaheim.

The Link US Project will greatly expand the station's pedestrian capacity with a new expanded concourse and passageway under the tracks and new platforms, escalators and elevators.

The project also includes opportunities for future transit-oriented development, improved connectivity to enhance the passenger experience, as well as design and safety improvements to U.S. Highway 101. The project is expected to generate more than 200 permanent jobs, and approximately 4,500 short-term jobs per year during the anticipated 5-year construction period.

Phase A of the project will implement the early action/interim improvements primarily associated with regional/intercity rail run-through track infrastructure south of LAUS, with two initial run-through tracks and associated property acquisition, as well as the necessary signal and roadway modifications. For a better look at the scale of the Link US project, see this video on the California High-Speed Rail Authority's YouTube page at <https://youtu.be/DnJhRzCr7LE>

#### **Exhibit 4.8:** Link US Project Rendering





## BNSF PARTNERSHIP

The Los Angeles to Anaheim project section is an extremely constrained existing three-track rail corridor, with roads, overpasses, businesses and homes abutting nearly every mile of the rail right of way. The corridor also is heavily used by existing diesel passenger and freight rail, which interoperate on the three tracks. Preliminary plans to add electrified high-speed rail tracks in this corridor involved adding two new dedicated electric tracks roughly parallel to the existing tracks, which would require a meaningful widening of the existing right-of-way into existing roads, buildings and homes.

Through a partnership with BNSF Railway (BNSF), CalSTA and regional rail providers, a concept was developed to accomplish largely the same capacity results with a four-track configuration (two freight and two electrified passenger) that will fit mostly inside the existing right of way, thereby reducing impacts in the main corridor. Offsetting the capacity lost by reducing freight to two tracks will require new facilities to be constructed in the Inland Empire. These facilities include the Lenwood Staging Tracks near Barstow and the Colton Intermodal Facility.

## FUTURE PALMDALE STATION PLANNING

In December 2020, the Palmdale City Council approved plans for future development near our proposed high-speed rail station. The Palmdale Transit Area Specific Plan details how land can be developed around the 746 acres near the future station. The Authority partially funded the plan that will create a multimodal transportation hub to connect high-speed rail, Metrolink, Brightline West, Amtrak and future light rail, as well as Greyhound bus services and other local transit options.

**Exhibit 4.9** displays a rendering from the City of Palmdale of its Station Area Plaza Concept.

“The concept is to have all the different modes – California High-Speed Rail, Metrolink, local transit, Brightline West, Amtrak, Greyhound and future light rail – in one location,” said Palmdale Mayor Steve Hofbauer. “This plan will accomplish that and more. It will help create a vibrant city center that will be an important part of our future.”

The Authority anticipates issuing final environmental documents for the Bakersfield to Palmdale segment in Spring 2021.

**Exhibit 4.9:** Palmdale Station Area Plaza Concept Rendering



## BRIGHTLINE WEST

Planning for high-speed train service between Las Vegas and San Bernardino County has been underway for more than a decade. As early as 2010, the State of California was working with a private-sector entity to explore and evaluate ways to coordinate planning. Brightline West, a Brightline-affiliated company, is planning to build a high-speed rail line to connect Las Vegas, Nevada and Victorville, California. The company currently operates service between Miami, Fort Lauderdale and West Palm Beach in Florida, and is actively building a line to extend service to Orlando.

This private developer is an important new high-speed rail presence in the Southern California region. We recognize that connecting the two systems would generate significant benefits, including higher ridership and the possibility of bringing high-speed rail benefits to Southern California sooner.

In January 2019, we joined CalSTA and Caltrans to collaborate with Brightline West through a Memorandum of Understanding (MOU). This agreement outlines our intent to:

- Evaluate opportunities to extend Brightline West to Palmdale, California, and interconnect with the California high-speed rail system;
- Share information on designs, operations, ridership and construction data to evaluate interoperability; and
- Evaluate and identify joint purchasing opportunities for materials and possibly rolling stock and reservation/ticketing systems.

The project anticipates creating approximately 15,900 construction jobs, and, when complete, employ 404 full- and part-time workers. It is forecast to provide significant environmental benefits as well by removing 2.8 million car trips annually, eliminating 100,000 metric tons of carbon emission from the Interstate 15 corridor.

The State of California has assisted Brightline West through granting the use of the Interstate 15 median to construct the Las Vegas to Victorville line and is currently considering additional freeway access to Rancho Cucamonga.

**Exhibit 4.10** displays a rendering from Brightline West of future train service in the state.

### Exhibit 4.10: Brightline West Train Rendering







Photo: Construction on the Conejo Viaduct

# COSTS AND FUNDING UPDATE

In order to advance the project, the Authority has reviewed the federal and state funding that is currently available to the program. We have completed updated, risk-adjusted cost estimates for meeting our federal commitment to construct 119 miles of high-speed rail infrastructure in the Central Valley and environmentally clear the entire 500-mile system from San Francisco to Los Angeles/Anaheim. These estimates are conservative and include additional risk contingency.

In addition, we recommend that we advance design to further develop 52 additional miles of high-speed rail extending south to Bakersfield and north to Merced. We also believe it would be prudent to continue this approach and advance design once environmental documents are complete on the remaining approximately 300 miles of high-speed rail to San Francisco and Los Angeles/Anaheim.

However, as has always been the case, the Authority needs additional, stabilized funding and financing options to successfully expand the program forward to deliver the full 500-mile high-speed system within the foreseeable future. The Authority and the Legislature's Peer Review Group have consistently communicated this to policy leaders and the public.

Risk is inherent in every complex infrastructure project. We propose steps here that recognize, manage and mitigate those risks. Importantly, we are making headway despite the many challenges we have faced. One important step we summarize in this Chapter is the proposal to phase track installation, starting with a single track on the Central Valley Segment and then the Merced and Bakersfield extensions.

## CHAPTER 5

We are very pleased to report in this chapter that, as of February 2021, we have submitted 100 percent of the \$2.5 billion federal American Recovery and Reinvestment Act match requirement, with the Federal Railroad Administration having approved 64 percent of that amount to date, and the remainder still under review.

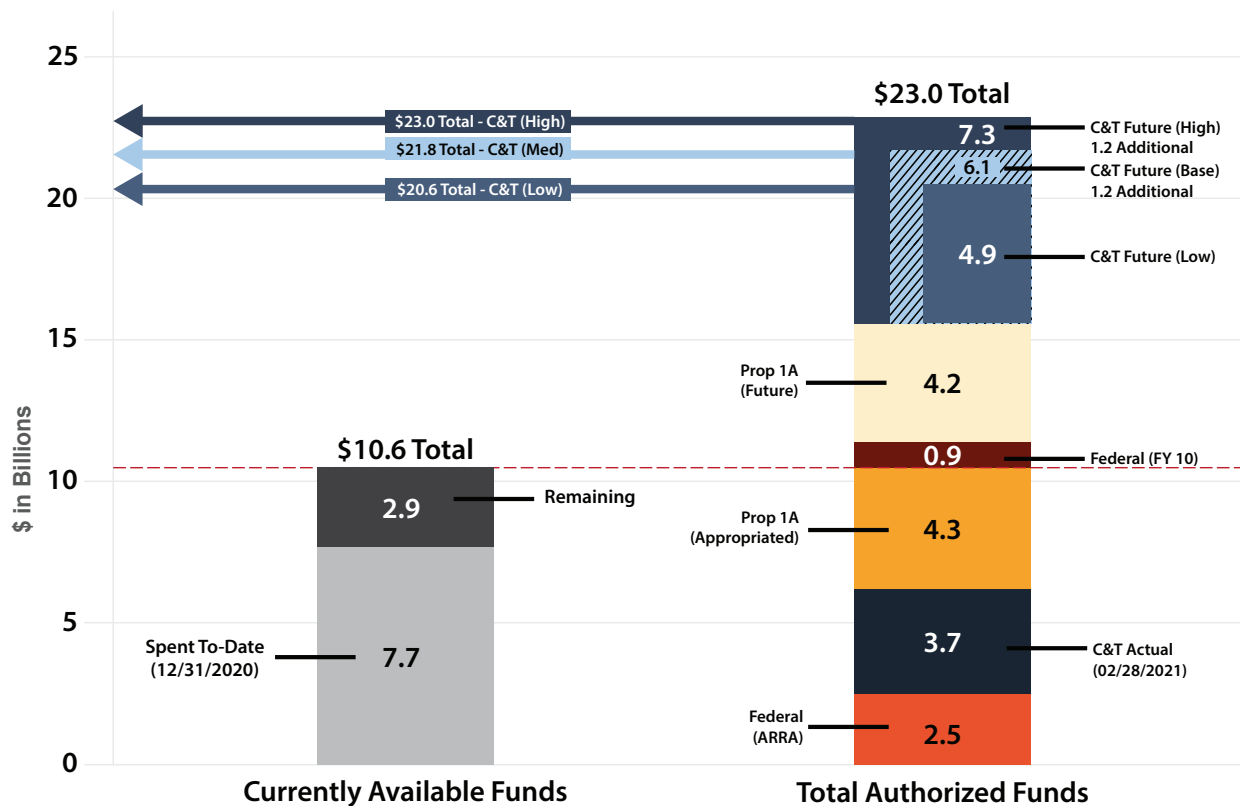
### Current Funding and Costs

This section provides an overview of the current and projected funding available to the Program through 2030, as shown in **Exhibit 5.0**. The exhibit provides a summary overview and component elements of the available funding and the following pages describe each funding source in detail. As shown by the exhibit, the total amount of identified revenue for the capital program is currently estimated in the range of \$20.6 billion to \$23.0 billion, with a medium forecast of \$21.8 billion. The medium forecast is based on a dynamic Cap-and-Trade market that best matches historical performance of the auctions. The ultimate amount will depend on Cap-and-Trade auction proceeds received through 2030.

Because the Authority's enterprise is the delivery of massive infrastructure under a set schedule, we reiterate in this plan the necessity of stabilizing the availability of Cap-and-Trade funds for this program. Such stabilization can be achieved through the following measures:



1. Extend the program through 2050 to provide a longer stream of funds to the program;
2. Create a floor to provide a minimum annual receipt to the Authority that would allow for more certainty around planning and procurement; and
3. Allow the financing of Cap-and-Trade to access future year receipts and accelerate program delivery.

**Exhibit 5.0: Currently Available and Authorized Funding**

Note: Assumptions have been adjusted from prior versions based on information released by the Air Resources Board during the February 2021 auction process which assumes a higher percentage of available allowances for 2021 compared to 2020 in relation to the annual greenhouse gas emission caps. This exhibit includes updated values based on recent information from different periods. Cap-and-Trade receipts have been updated for February auction results. Program expenditures are through December 31, 2020.

## STATE FUNDING

The Authority has secured funds from two State sources: Proposition 1A bond funds and Cap-and-Trade funds. No General Fund dollars are allocated to the high-speed rail project.

### PROPOSITION 1A FUNDING SUMMARY

In 2008, Californians voted to build electrified high-speed rail by approving Proposition 1A, which provided \$9.95 billion for high-speed rail planning and construction. Of this, \$9 billion was allocated to the Authority and \$950 million was allocated to

local high-speed rail connectivity projects under the oversight of the California Transportation Commission.

Since 2017, the Director of California's Department of Finance has approved four funding plans to access a total of \$3.7 billion in Proposition 1A funds, specifically \$2.6 billion for the Central Valley, \$600 million for the Caltrain Peninsula Corridor Electrification Project in Northern California, and \$77 million for the Rosecrans/Marquardt Grade Separation Project in Southern California. In April

2020, the Board of Directors approved a funding plan for \$423 million for the Link Union Station (Link US) Project. This action completed the allocation of all bookend funding to regional construction projects in Southern California and the San Francisco Bay Area.

As of December 31, 2020, the Authority has expended 99 percent of the authorized \$2.6 billion of Proposition 1A Central Valley construction funds and has put those dollars directly to work building high-speed rail infrastructure. This 2020 Business Plan recommends \$4.1 billion in remaining bond funds be directed to complete delivery of the 119-mile Central Valley Segment, and \$100 million in remaining bond funds be used for early design and completing environmental on in environmental review on San Francisco to Los Angeles Phase 1 segments. This 2021 Proposition 1A Funding Plan was submitted to and approved by the Board on February 9, 2021. It was subsequently submitted to Legislature on February 12, 2021.

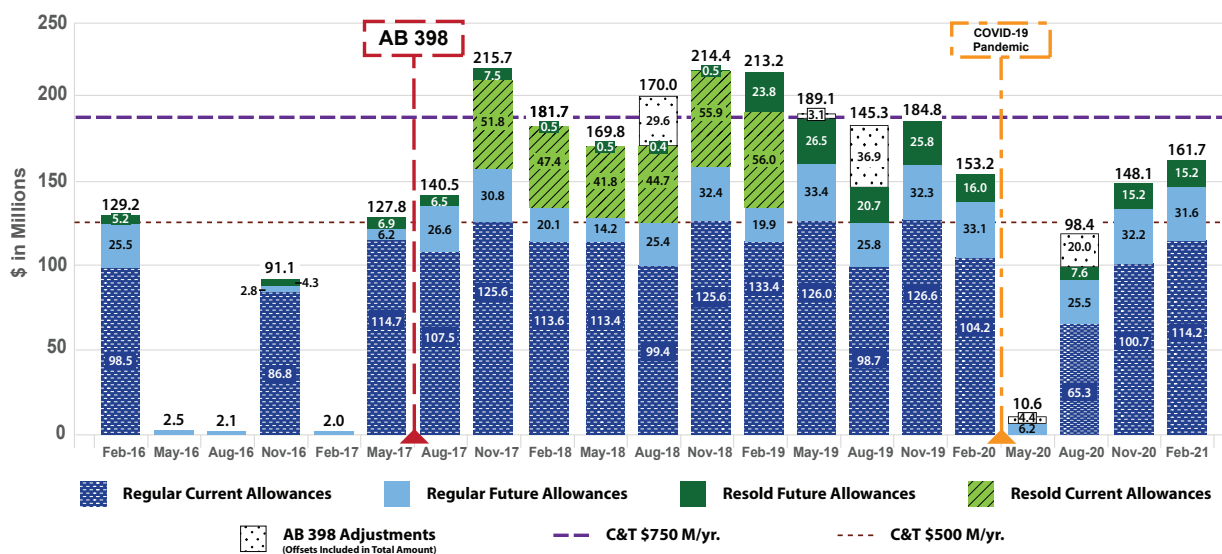
### **CAP-AND-TRADE FUNDING SUMMARY**

Through the February 2021 auction, the Authority has received a total of \$3.7 billion in Cap-and-Trade funds, which includes the initial \$650 million appropriation in 2014 and quarterly auction proceeds since August 2015.

To reduce greenhouse gas (GHG) emissions in California, the Legislature authorized the development of a trading system of carbon-emissions allowances, also known as the Cap-and-Trade Program. The Cap-and-Trade Program covers approximately 80 percent of California's GHG emissions and is a central policy that underpins the California Air Resources Board's Scoping Plan to reducing GHG emissions 40 percent from 2020 levels. The California Air Resources Board implements the program and oversees the quarterly auctions, which are a long-term source of funding for the high-speed rail project and for regional transit and rail projects statewide.

We established a range of future Cap-and-Trade receipts for purposes of capital planning—low, medium and high. The low range assumes that the Authority will receive \$500 million per year, and the high range assumes \$750 million per year. The medium range is based on the dynamic performance of the Cap-and-Trade market and matches the historical performance of the auctions. As shown on **Exhibit 5.1**, since July 2017, the Authority has received approximately \$639 million annually through the February 2021 auction; and includes four auctions conducted during emergency orders established to address COVID-19, which significantly depressed revenues.

**Exhibit 5.1: Quarterly Cap-and-Trade Auction Proceeds for High-Speed Rail (\$ in Millions)**



## 2020 AND 2021 FUNDING

Authority proceeds for the May 2020 auction were \$6.2 million, with an additional \$4.4 million adjustment from prior quarters—this low revenue result was a direct result of the impact of the COVID-19 pandemic on the state’s economy.

In August 2020, the Cap-and-Trade auction yielded \$98.4 million for the Authority. In this auction, 100 percent of the advanced allowances offered were sold, and approximately 80 percent of the current allowances offered were sold. The increase in the August auction yield, combined with the 100 percent subscription from the November 2020 auction that resulted in revenues of \$146.8 million, and \$161.7 million from February 2021, demonstrate a Cap-and-Trade market that has incrementally recovered. This is generally a good indicator for the remaining auctions in 2021. That said, the worldwide pandemic is not over, and the recent volatility of the Cap-and-Trade market is a reminder that this source of funding for a major infrastructure project—that requires stable funding—should be stabilized.

Currently, the Cap-and-Trade program has 32.69 million previously unsold current allowances—the result of the less than fully subscribed May and August auctions. Now that the February 2021 auction has concluded, being fully subscribed, the previously unsold allowances will now begin being offered starting with the May 2021 auction.

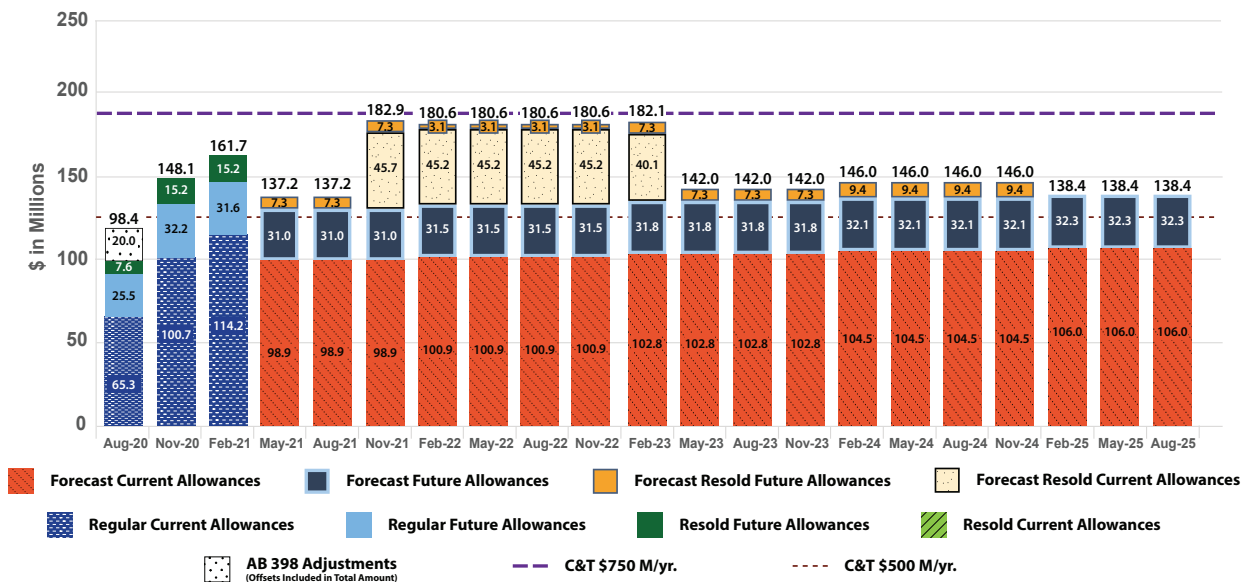
This could result in upwards of \$144.5 million in revenues—assuming that all of the current 32.69 million unsold allowances are sold at the floor price of \$17.71 at the May 2021, August 2021 and November 2021 quarterly auctions. Actual receipts will ultimately depend on how the Cap-and-Trade market participants forecast their level of GHG emissions (and thus the Cap-and-Trade allowance requirements) in the short- to medium-term.

## FUTURE NEAR-TERM FUNDING

Because of this uncertainty in the Cap-and-Trade market, the Authority has developed different Cap-and-Trade revenue scenarios for FY2020-2021 and FY2021-2022 depending on the assumed level quarterly auction subscription and allowance price. The low case assumes a receipt of \$500 million per year through 2030. The high case assumes a receipt of \$750 million per year through 2030. **Exhibit 5.2** shows the medium case option which includes the following:

### Medium Case Scenario

- The February 2021 auction is updated for actual receipts of \$161.7 million.
- Assumptions have been adjusted from prior versions based on information released by the Air Resources Board during the February 2021 auction process, which assumes a higher percentage of available allowances for 2021 compared to 2020 in relation to the annual greenhouse gas emission caps.
- Starting May 2021, quarterly auction revenues are fully subscribed at the auction floor price as the economy recovers from the COVID-19 pandemic. Starting May 2021, auction revenues are assumed to be controlled by fully subscribed auctions selling at the auction floor price.
- Assumed to be a dynamic scenario to reflect the performance of the market and the way that revenues would flow to the Authority as a result.
- Previously unsold allowances are resold starting in May 2021, which would be a similar pattern to the auction recovery period after AB 398 was enacted in 2017.

**Exhibit 5.2: Medium Case Forecast Short Term Quarterly Cap-and-Trade Auction Proceeds for High-Speed Rail (\$ in Millions)**

As the effects of COVID-19 recede over time and as the state continues to implement climate actions to achieve its 2030 GHG emissions reduction targets, the total long-term cumulative Cap-and-Trade revenue for the Authority will likely show minimal long-term impact. As successive auctions occur in 2021, the long-term effects of COVID-19 on the Cap-and-Trade program and the Authority's revenue will be better understood. We will continue to analyze and track this issue in the coming months.

## FEDERAL FUNDING

The Authority has received approximately \$3.5 billion in federal funding commitments to complete environmental review for the Phase 1 system and to construct the 119-mile Central Valley Segment between Madera and Poplar Avenue. Of this:

- \$2.5 billion was from the federal American Recovery and Reinvestment Act of 2009 (ARRA) and;

- \$929 million was appropriated by Congress from Fiscal Year 2010 (FY10) Transportation, Housing and Urban Development funds.

These funds were awarded to us by the Federal Railroad Administration (FRA) through federal grants. This federal partnership was instrumental in enabling us to advance the program into construction.

## AMERICAN RECOVERY AND REINVESTMENT ACT (ARRA) GRANT

The \$2.5 billion in ARRA funding was fully expended before the statutory deadline and in compliance with the FRA grant requirement. As approved by the FRA, federal funds were expended first, followed by the expenditure of state matching funds. This provision was approved due to the short ARRA expenditure deadline.

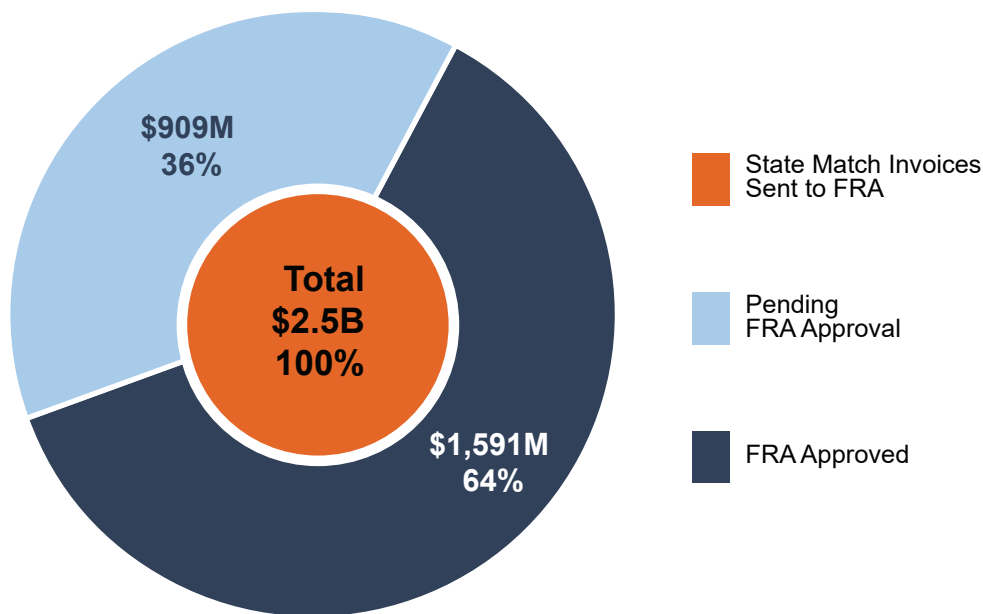
We worked cooperatively with the FRA to ensure that these funds were expended appropriately by September 2017. Having spent the federal funds, the Authority is now required to match those funds by the grant deadline of December 2022.



As shown in **Exhibit 5.3**, we are nearing completion of that match—currently shown at 99.5 percent as of November 30, 2020. We achieved the full match required for this grant by February 2021, 22 months ahead of the deadline.

Through February 2021, the Authority has submitted to the FRA 100 percent of the \$2.5 billion match requirement for approval. The FRA has approved \$1.6 billion, approximately 64 percent, and another \$909 million is currently under internal FRA review.

**Exhibit 5.3: ARRA State-Match Status Update (as of February 28, 2021)**



### ■ STATUS OF FEDERAL FY10 GRANT

Per the terms of the federal grant agreement, the FY10 funds, along with \$360 million of state matching funds, are scheduled to be the last funding required to complete the federal grant scope of work.

We have worked with the FRA collaboratively over the last 10 years to execute the requirements of the grant agreements. We continue to provide the deliverables and reports stipulated in these agreements. In spite of that, the FRA Administrator de-obligated the \$929 million in federal FY10 grant funds in May 2019, taking the position that the project had failed to make steady progress.

Subsequently, the State of California and the Authority filed a lawsuit against the U.S. Department of Transportation (U.S. DOT) and the FRA in the Federal District Court, Northern District (San Francisco), asking the court to enter a judgment in favor of the Authority to set aside an FRA decision to terminate the \$929 million FY10 Grant Agreement entered into between the FRA and the Authority. Our position in the lawsuit is that the FRA was in violation of federal law, acted outside of the FRA's policies, procedures and ordinary practice, and was politically motivated in terminating the grant.

More recently, the Authority has engaged with the Biden Administration on re-establishing the important partnership between California and the federal government in delivering this project as it reflects the new administration's policies and priorities related to both transportation and climate change. We will work with the new leadership at U.S. DOT on a range of issues, including restoring the \$929 million of FY10 grant monies, schedule flexibility for current deliverables and an improved project oversight relationship.

## **MANAGING REVENUES AND CASHFLOW**

The Authority has multiple appropriations to fund its commitments currently in place. But with the volatility that has been experienced within the Cap-and-Trade program during 2020 as a result of the COVID-19 pandemic, further measures must be taken to provide surety to ongoing delivery of construction packages in the Central Valley.

The Central Valley Proposition 1A appropriation for construction has been largely utilized through FY 2019-20, which means that Cap-and-Trade proceeds are currently forecasted to fund the majority of Central Valley construction in FY 2020-21 and beyond.

Fortunately, the Authority's Cap-and-Trade cash balance was \$2.4 billion at the start of the 2020/21 fiscal year, which provided for a strong opening balance for the fiscal year. As noted above, the Authority plans to submit a budget request to

the Legislature for the remaining balance of Proposition 1A funds of \$4.2 billion.

Access to the remaining Proposition 1A funds in 2021 is urgent to advance the currently underway construction work in the Central Valley. In addition to expanding the growing labor workforce on the project, dedicating the remaining bond funds to their intended purpose of project construction will mitigate any schedule impacts and will allow the Authority to use the more flexible Cap-and-Trade funds for other program priorities over time. The Proposition 1A funds would be dedicated to keeping men and women working to complete Central Valley construction and advancing environmental documentation and planning on the San Francisco to Los Angeles/Anaheim segments.

The Proposition 1A appropriation for bookends remains available to cover those expenditures in FY 2020-21. FY 10 federal funds are not anticipated to be accessible for the project until 2022, per the current federal grant agreement matching requirements.

The Authority has a strong focus on cash management. We maintain detailed forecasts of our sources and uses, which are updated regularly. We continue to work closely with the Department of Finance to monitor both expenditures and future Cap-and-Trade proceeds from upcoming auctions, to provide information on all other funding sources, and provide a range of analysis on different scenarios. This is an important aspect of the cash management process.

## SUMMARY OF PROJECTED AND EXPENDED FUNDING TO DATE

**Table 5.0** summarizes the total forecasted funding for the project through 2030, how much has been expended through November 2020, and the total remaining funds available. Consistent with our assumptions, the table shows a range for future Cap-and-Trade funds. It also shows the remaining Proposition 1A dollars available to the program.

The Authority's ability to use the remaining Proposition 1A funds will require an appropriation by the Legislature and completion of the statutorily required funding plan (Section 2704.08 (d), California Streets and Highways Code). The Authority anticipates requesting a Proposition 1A construction appropriation for inclusion in the 2021 Budget Act.

**Table 5.0: Summary of Total Funding Available and Total Funds Expended as of 12/31/2020**  
(\$ in Billions)

Funding Source	Total Funding A	Total Expended* B	Total Remaining C = A - B
<b>Federal Funds</b>			
ARRA Construction	2.1	2.1	0.0
ARRA Planning	0.5	0.5	0.0
FY10	0.9	0.0	0.9
<b>State Funds</b>			
Proposition 1A Project Development	0.7	0.6	0.1
Proposition 1A Central Valley Segment Construction	2.6	2.6	0.0
Proposition 1A Bookends	1.1	0.2	0.9
Proposition 1A for future Construction Appropriation	4.1	0.0	4.1
Cap-and-Trade Received through February 2021	3.7	1.7	2.0
Subtotal	15.7	7.7	8.0
Future Cap-and-Trade**	4.9 to 7.3	0.0	4.9 to 7.3
<b>Total</b>	<b>20.6 to 23.0</b>	<b>7.7</b>	<b>12.9 to 15.3</b>

Notes: Numbers might not total due to rounding

\*Excludes administration and other State operations expenditures

\*\*Future Cap-and-Trade funding assumes a low of \$500 million to a high of \$750 million per year from 2020 to 2030 (9.75 years)

## CAPITAL COST ESTIMATES FOR CURRENT PROGRAM

In Chapter 3, we described the work currently underway, and in Chapter 4 we outlined our proposed implementation plan for moving forward. In this section, we summarize the costs to do that work.

### COST TO COMPLETE – CENTRAL VALLEY SEGMENT

As detailed in Chapter 2, the Authority has been able to advance the project through immense challenges caused by the COVID-19 pandemic and the continued challenge of advancing the Central Valley construction. However, as is the case with all public transit agencies in California, we also need to adjust our schedule and costs to move the project forward in the most efficient manner possible. This represents the Authority's ongoing

process of reviewing and managing risk. The cost and time to complete construction of the Central Valley Segment has increased due to the realization of risk and the refinement of scope. Some of the increase represents scope changes that have been made to address requests by local jurisdictions and other stakeholders; some represents revised estimates. Because risks remain that could further affect both schedule and costs, we also propose to increase our contingency budget.

We initiated a cost and schedule risk review of the 119-mile Central Valley Segment in 2020 to complete it in time for the February 2021 release of the Revised Draft Business Plan. The results of the review provide a snapshot of our estimate to complete the Central Valley Segment at that point in time. Overall, the net change would increase construction base costs by \$330 million which represents the known cost increases at that juncture. Because there are still considerable risks associated with completing construction, it is prudent to budget an additional \$1.0 billion for contingency. This would require us to adjust our budget for the Central Valley Segment from \$12.4 billion to \$13.8 billion to accommodate identified costs and risks. This revised total incorporates proposed cost mitigations as well. The changes are summarized in **Table 5.1** and a comparison to the Central Valley Segment costs as included in the adopted 2019 Program Baseline is shown in **Exhibit 5.4**. Based on this, the 2019 Program Baseline would increase from \$15.6 billion to \$16.9 billion as shown in **Table 5.3**, well under the projected funding forecasts.

Adding \$1.0 billion to the budget for contingency augments the \$420 million set aside for program

wide contingency in the previously approved \$12.4 billion Central Valley budget, along with \$154 million in reserves that remain as part of our FY10 grant agreement with the Federal Railroad Administration, and provides additional mitigation for risk. There are risks ahead in completing the design build construction packages, particularly in Construction Package 2-3 where the intrusion protection barrier, Cross Creek and Deer Creek structures, and the final phases of the Hanford Viaduct still need to reach final settlement. The budget established in **Table 5.1** considers these issues and the Authority will manage and mitigate these risks to stay within the proposed program budget. Of course, the Authority will remain transparent in reporting risks that have materialized, how much they cost and how much contingency needs to be used to pay for them within the Program Baseline budget.

Our risk confidence level in meeting our estimate remains relatively the same as it was in 2019. However, our knowledge is more detailed based on the recently conducted enhanced risk assessments, work we have completed with stakeholders and third parties, and the work that is now underway with contractors.

As discussed in Chapter 6, Refocusing the Enterprise on Risk Management, the Authority has enhanced its risk management and oversight program. Among other things, our intent is to bring increased focus on monitoring and evaluating emerging trends which provides earlier opportunities to implement mitigation measures in order to lessen their potential impact.



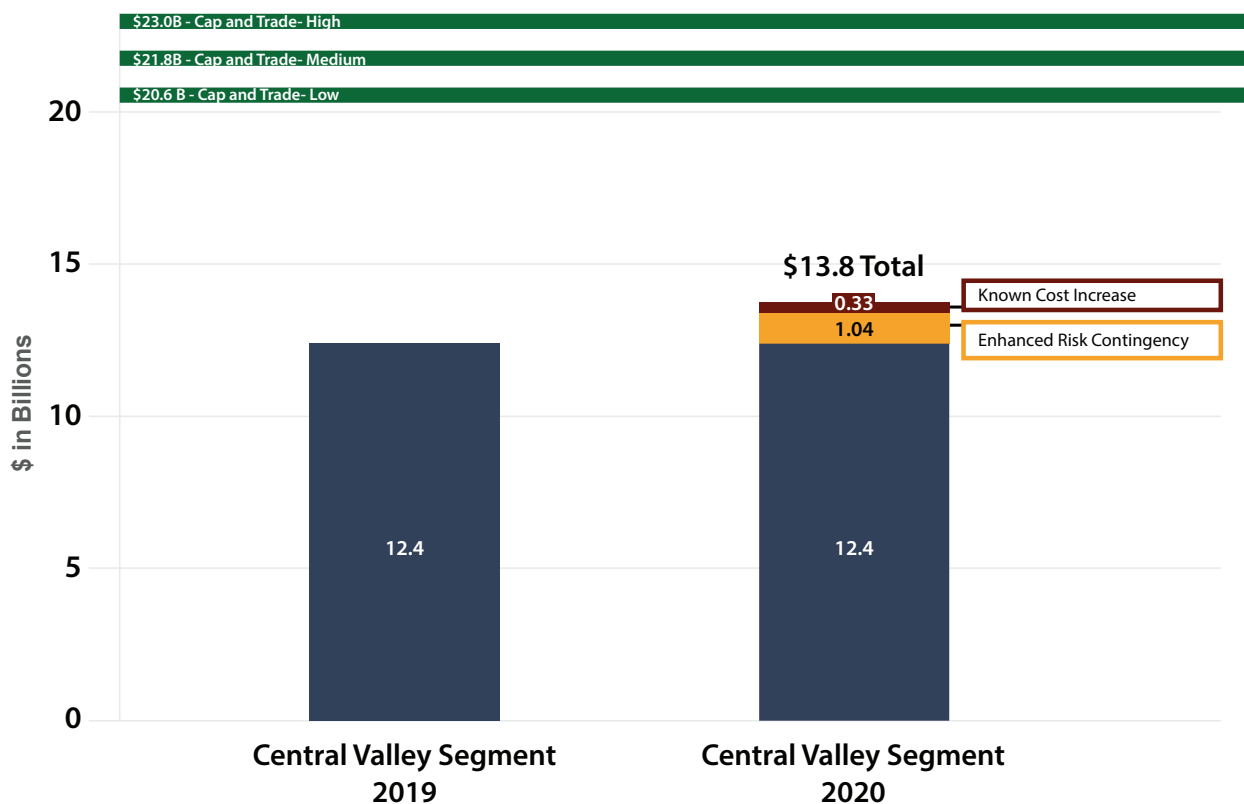
As described in Chapter 3 and Chapter 4, to mitigate risk the Authority is evaluating the option of phasing the track installation by initially laying a single track on the 119-mile Central Valley Segment. This action, if taken, would mitigate cost

risks and improve construction efficiency and allow us to test and certify trains and systems on the 119-mile Central Valley Segment. Further evaluation of this option is underway and will be informed by the Track and System bids that are due in July 2021.

**Table 5.1: Central Valley Estimate at Completion Update (\$ in Millions)**

Category	Cost Change	Additional Contingency
CP 1	294	348
CP 2-3	44	418
CP 4	(24)	92
ROW for CP 1-4	156	82
Net other adjustments (Program support, stations and other costs)	(140)	101
<b>Total Cost Changes</b>	<b>330</b>	<b>1,041</b>

**Exhibit 5.4: Central Valley Segment Construction – Funding Plan Scope**



## RECOMMENDED ENHANCEMENTS TO THE PROGRAM BASELINE

We are also recommending enhancing the 2019 Program Baseline to advance design work for the Merced and Bakersfield extensions. In addition, we also recommend including costs associated with completing the operational segment. Specifically, we propose to advance design work, including mapping right of way, conducting geotechnical evaluations, negotiating third party agreements and identifying environmental permits.

This would include:

- \$155 million for the Merced and Bakersfield extensions and the Merced, Fresno, Kings/Tulare and Bakersfield stations;
- \$389 million for trainsets; and
- \$787 million for program-wide costs.

Trainsets are required to initially test and certify the system and to subsequently be used for early interim service between Merced and Bakersfield.<sup>7</sup> As noted in Chapter 4, however, we are exploring various options with the California State Transportation Agency and the San Joaquin Joint Powers Authority, which includes potentially leasing trains. Doing so might allow us to reduce or defer some initial costs.

Budgeting for additional program-wide costs will support all aspects of the program starting in FY 2022-23, including advancing design work, full completion of existing civil contracts, the future track and systems contract and acquiring trainsets. These additional design and trainset investments

are not part of the current Board-approved 2019 Program Baseline. Adding these investments would increase the current 2019 Program Baseline by \$1.3 billion to a proposed program baseline of \$18.2 billion.

In addition, our policy recommendation, as described in Chapter 4, is to continue to advance engineering statewide as each project section environmental document is completed and funds become available. Decisions related to moving forward with these investments would be made incrementally as each document is completed. The costs to do this work is estimated to be:

- **Northern California:** \$213 million for the two sections between San Francisco and the Central Valley Wye; and
- **Southern California:** \$382 million for the four sections between Bakersfield and Anaheim.

As we proceed with advancing design work in project sections, the scope and associated costs would be brought forward into the Program Baseline with a corresponding reduction in the remaining Phase 1 system segment costs. A portion of the future program-wide support costs would also be brought forward into the Baseline.

## BUILDING THE MERCED AND BAKERSFIELD EXTENSIONS

As described in Chapter 4, our goal is to deliver initial service between Merced and Bakersfield. Because these extensions are environmentally cleared, they are ready for advancing design work now. Over the next two years, we will have a clearer picture of both the costs for these extensions and the funding available for their construction and other elements for interim service. Our costs will be informed by advancing design work, conducting value engineering, and further consultation with the California State Transportation Agency and San Joaquin Joint Powers Authority on a train procurement strategy. Our implementation plan will be informed as we have more clarity on Cap-and-Trade revenues and potential new federal

funds that might become available with the new Biden Administration and Congress.

As noted in Chapter 3, we are proposing a phased approach to installing track, initially laying single track on the 119-mile Central Valley Segment. We propose to continue this approach for the full 171-mile Merced to Bakersfield line for initial interim service. **Table 5.2** provides a summary of the initial estimates to complete that work. The estimated cost to add the second track to the 171-mile line is \$1.1 billion; however, the second track is not needed to achieve the operational benefits of the proposed Merced to Bakersfield interim service and would be installed at a later date to meet future service demand. As we advance design, we will consider various project elements and their associated costs that might be either added, reduced or deferred.

**Table 5.2: Capital Cost Estimates for Merced and Bakersfield Extensions (\$ in Millions YOE)**

Segment	Low	Base	High
Merced Extension (single track)*	1,885	2,252	2,744
Bakersfield Extension (single track)*	940	1,297	1,469
Trainsets for Interim Operations	246	291	301
Central Valley Stations** (Fresno and Kings/Tulare)	-	116	-
<b>Total</b>	<b>3,071</b>	<b>3,956</b>	<b>4,514</b>

\* Includes Merced and Bakersfield stations.

\*\* Station costs are accounted for in the Low and High range.

The total estimated costs to complete the Central Valley Segment, proposed enhancements and the Merced and Bakersfield extensions for interim operations are shown in **Table 5.3**. As discussed previously, we estimate a range of revenues from \$20.6 billion to \$23.0 billion and our cost estimates range from \$21.3 to \$22.8 billion.

As we move forward with additional work, we will continue to assess the funding available. Our priority is to complete a Merced to Bakersfield service. However, we are committed to advancing design in Northern and Southern California as environmental documents are completed.

**Table 5.3: Current and Proposed Program Capital Cost Summary (\$ in Millions YOE)**

Cost Category	Cost Estimate
<b>Updated Program Baseline:</b> <ul style="list-style-type: none"> <li>Central Valley Segment Construction</li> <li>Track &amp; Systems (single-track)</li> <li>Statewide Environmental Clearance</li> <li>Regional Bookend Projects (Northern and Southern California)</li> </ul>	16,919
<b>Proposed Enhancements - Program Baseline:</b> <ul style="list-style-type: none"> <li>Advance Design: Merced/Bakersfield Extensions and Central Valley Stations</li> <li>Trains for initial system testing and certification</li> <li>Program wide support</li> </ul>	1,331
<b>Merced and Bakersfield Extensions/Operational Elements:</b> <ul style="list-style-type: none"> <li>Merced Extension (single track)</li> <li>Bakersfield Extension (single track)</li> <li>Trainsets and High Voltage Power Substation for Interim Operations</li> <li>Fresno and Kings/Tulare Stations</li> </ul>	3,071 – 4,514
<b>Subtotal</b>	<b>21,321 – 22,764</b>
Northern California Advance Design	213
Southern California Advance Design	382
<b>Total</b>	<b>21,916 – 23,359</b>

## Future Funding and Costs

Additional funding is required to deliver the full 500-mile system. By advancing design on the remaining project sections from San Francisco to Los Angeles/Anaheim, they will be one step closer to being ready for construction and more competitive for additional funding. Planning for future funding opportunities is a key reason for one important change in our implementation strategy – to advance design when each environmental document is complete.

The project sections from Bakersfield to Anaheim and from San Francisco to Carlucci Road are still undergoing environmental review and clearance and are still in relatively early stages of design. Because of that, the cost estimates for these sections are preliminary. As each section is cleared,

advancing to the next stage of design will allow us to further refine the cost estimates.

This section discusses potential future funding options and summarizes the current cost estimates for the remaining system. The exact timing of when future construction may occur depends on when funds are available. The cost estimates shown in this section are based on what we know about these alignments today and assumptions we have made regarding the timing of their construction. Assumptions regarding timing are only for purposes of presenting the cost estimates in year of expenditure dollars.

## OPTIONS FOR FUTURE FUNDING

High-speed rail projects around the world share a key constant; although generally operationally financially sustainable, they require public sector



investment to construct the infrastructure and establish operations. This is because such systems require a size of investment that is generally too great for any private-sector organization to bear.

This is true not of only high-speed rail, but of road transportation, transit and aviation infrastructure, which is why they are all most commonly initiated by government entities. What these critical infrastructure projects have in common is that these public investments act as catalysts for wider economic growth. Although it is easy to focus on their singular price tag, critical projects such as these should really be viewed in the context of the wider fiscal, social, environmental and economic benefits they bring to the region. For example, imagine how California would operate today with no freeway system or airports.

California's high-speed rail project has long been challenged by funding instability, a natural constraint that is also common to transportation infrastructure within California, the United States and around the world. Given those constraints, the only realistic approach that a large infrastructure project such as this can take is to invest incrementally with the funds that are on hand and to solicit other sources of funding over time.

This is what the voters intended when they approved Proposition 1A in 2008 to initiate the construction of a high-speed train system that connects San Francisco to Los Angeles and Anaheim and links the state's major population centers. The voters understood that additional funds would be necessary to complete the construction, and they required the Authority to match this initial investment with other funding sources, which has been achieved with both federal grants and Cap-and-Trade funds. At the same time, voters also established in Proposition 1A that funds could be used to advance planning and project development across the entire 500-

mile system while focusing construction on usable segments that had independent utility. This has been the strategy the Authority has pursued and that is laid out in this Business Plan.

We started this incremental approach as we made the initial investments to launch construction in the Central Valley and to fund pre-construction activities in Northern and Southern California, such as design and environmental reviews. These pre-construction activities play a critical part of our commitment to support seamless connectivity with regional transit and rail providers, as outlined in the 2018 State Rail Plan.

## **GAINING ACCESS TO ADDITIONAL FUNDING**

As explained in the Current Funding section above, the Authority currently has access to four sources of funding—federal grants from the American Recovery and Reinvestment Act and from FY10 Transportation, Housing and Urban Development appropriations, and state funds from Proposition 1A bonds and Cap-and-Trade auction receipts.

The Authority has now fully expended the ARRA funds in compliance with the terms of the ARRA grant, and FY10 funds are assumed to be available to the project in 2022. The Authority has expended most of the \$4.3 billion of Proposition 1A funds appropriated in 2012, leaving \$4.2 billion in remaining funds for high-speed rail construction and early design and environmental work; these funds have yet to be appropriated by the Legislature.

### **Proposition 1A Appropriation and Construction Progress**

A new Proposition 1A bond appropriation is needed to address the FY 2021-22 and beyond cashflow needs of Central Valley construction. Prior Proposition 1A Central Valley construction funds have been expended and Cap-and-Trade cash balances are falling each quarter as construction expenditures are exceeding incoming Cap-and-Trade auction proceeds. New Proposition 1A funds will allow Central Valley construction to continue through completion without delay. If new Proposition 1A funds are not approved, the Authority will be forced to suspend most construction activity and with that most of the 1,000 weekly construction jobs will be eliminated. Additionally, funds will be redirected to costs related to closing construction sites and, later, to delay claims. Such a delay would also create new risks for prior federal grants and limit opportunities for future federal funding.

Cap-and-Trade funds are received quarterly, and the Authority's share depends on auction results. The Authority maintains a balance of Cap-and-Trade funds, and this balance fluctuates depending on receipts and expenditures. As discussed in the Current Funding section above, the COVID-19 pandemic has added further volatility into the market, reflected by unpredictable quarterly revenues for the Authority.

### **STABILIZING CAP-AND-TRADE FOR HIGH-SPEED RAIL DEVELOPMENT**

As more wildfires and droughts occur, Californians place addressing climate change as an increasingly higher priority. The state's climate change policies target an 80 percent emissions reduction from 1990 levels by 2050. Extending the Cap-and-Trade

Program to 2050 would be an important new pillar in meeting the state's policy goals by creating a market-based mechanism for regulating those emissions. The extension of Cap-and-Trade to 2050 would align the program to the target date and create a long-term source of funding for impactful transportation investments that can support the policy.

For example, other public transportation programs, such as the Transit and Intercity Rail Capital Program (TIRCP), would benefit from a Cap-and-Trade extension. The TIRCP provides grants to fund transformative capital improvements that will modernize California's intercity, commuter and urban rail systems, as well as bus and ferry transit systems, to significantly reduce greenhouse gas (GHG) emissions, vehicle miles traveled and congestion. The TIRCP could receive an additional \$4 to \$6 billion in grant funds if the Cap-and-Trade Program was extended. Similarly, the Low Carbon Transit Operations Program, which provides both capital and operating assistance for transit agencies to reduce greenhouse gas (GHG) emissions and improve mobility with a priority on serving disadvantaged communities, could receive an additional \$2 to \$3 billion.

Extending the program would also help the state achieve other important policy objectives, including creating more affordable housing and fostering sustainable communities. For example, the Affordable Housing and Sustainable Communities Program could receive an additional \$8 to \$12 billion from a Cap-and-Trade extension to 2050. This program funds loans and grants, which include support for transit-oriented development projects, such as mixed commercial and residential projects, that optimize access to public transport.

As shown in **Table 5.4**, extending the Cap-and-Trade Program to 2050 would generate between \$40 billion to \$60 billion in additional funding for the state's Greenhouse Gas Reduction Fund and

could provide an additional \$10 billion to \$15 billion in future funding for the high-speed rail program.

**Table 5.4: Range of Additional Funding Generated by Cap-and-Trade Extension to 2050**  
(\$ in Billions)

Funding Uses	Allocation Percentage	\$2.0 Billion/ Year Scenario	\$3.0 Billion/ Year Scenario
High-Speed Rail	25	10	15
Transit and Intercity Rail Capital Program (TIRCP)	10	4	6
Low Carbon Transit Operations Program (LCTOP)	5	2	3
Affordable Housing/ Sustainable Communities Program (AHSC)	20	8	12
Safe and Affordable Drinking Water Program	5	2	3
Discretionary Funding for Other Projects	35	14	21
<b>Total</b>	<b>100</b>	<b>40</b>	<b>60</b>

\*Exhibit assumes current Cap-and-Trade revenue allocations are maintained from 2031 to 2050.

These projections are based on total state Cap-and-Trade revenues continuing to come in at between \$2 billion to \$3 billion per year and the Authority maintaining its current 25-percent continuous annual appropriation.

With a Cap-and-Trade extension, we would likely accelerate access to these funds through financing. As discussed below, any financing will incur an added cost of debt, which will erode the base receipts, but our ability to maintain the construction schedule will significantly reduce the impact of inflation on construction costs.

### **FINANCING AGAINST CAP-AND-TRADE AUCTION RECEIPTS**

Financing refers to the securitization of a future stream of revenues. In simple terms, it is the receipt of funds today that will be paid back from funds received in the future. In order to accelerate the construction of future system segments, we could seek a lender for funds and would pledge future earnings, receipts from the Cap-and-Trade Program or similar, as repayment. In return for providing the

money up front to the Authority, the lender would charge interest and other fees.

To be confident enough to make the loan, the lender is primarily focused on the ability of the borrower to repay it as scheduled; this is called the credit quality of the borrower. A borrower with low credit quality will find it hard to access finance or be burdened with a punitive cost of borrowing (e.g., paying a high interest rate). If the borrower can enhance its credit quality so that the lender is comfortable with the risk profile, the cost of borrowing will often reduce.

The current structure of the Cap-and-Trade Program does not present a financeable structure because it contains a level of inherent volatility and a time horizon that would not make it creditworthy to a lender.

As discussed in preceding Business Plans, financing against future receipts from the Cap-and-Trade Program could accelerate funding to the project and provide a significant new source of funds to the program. The Cap-and-Trade Program's

creditworthiness could be enhanced in three critical ways:

**1. Non-impairment of appropriations to the California High-Speed Rail Authority.**

For future receipts from the Cap-and-Trade Program to be financeable, the market must have confidence that the revenues flowing to the Authority will not be restricted or redistributed. We have already seen this type of redistribution in AB 109, in which the Legislature reduced the Authority's net receipts. All revenues due to the Authority must be received in full.

**2. Extension of the program through 2050.**

Although the extension of the Cap-and-Trade Program through 2030 represented a move in the right direction, the extension does not provide funding past that date. Without the inclusion of receipts from 2031-2050, the program's future proceeds will be significantly lower than previously assumed.

**3. Minimum Guarantee.** Because it is an auction-based system that sells credits to industry for emitting greenhouse gases, the Cap-and-Trade Program's revenues change quarter over quarter. The Authority has witnessed this potential for volatility through past periods, something that the COVID-19 pandemic has exacerbated. As a result, the financing community cannot satisfactorily determine with enough certainty how future revenues will perform. This makes lending money against them problematic. For this stream of funding to be financeable, the State would need to provide a minimum guarantee, or a backstop, to these funds. This means that if the revenues fell below stated minimum levels, the State would contribute the difference allowing the lender to be made whole. This would enhance the credit

quality of the revenue stream, making it more financeable, if the other required elements are also added.

## FEDERAL FUNDING

Major transportation projects have typically been partly financed by the federal government. For example, the Interstate Highway system had federal share up to 90 percent. The federal highway programs have been funded by taxing highway users. No such federal funding program yet exists to support high speed rail. If such a program is developed by the Biden Administration, California can make a strong case for support from the program. In 2020, the House of Representative passed the "Moving Forward Act" that included a more than four-fold increase in passenger rail funding—California is well-positioned for any federal funding approach for passenger rail and Cap-and-Trade funding already committed to the California high-speed rail project could be one source for California's matching share.

Given this, there is a strong case that additional future federal participation in the California high-speed rail program is warranted, starting with additional funding for the Silicon Valley to Central Valley line because it would leverage a significant increase in ridership, connectivity among major urban centers, revenues, and the value of private sector concession agreements. This is consistent with historical precedent where the federal government plays an important role in funding large infrastructure projects, and it reaffirms the reasonableness of the assumptions in Proposition 1A.

## RECENT ACTIVITY ON NEW FEDERAL FUNDING

The COVID-19 pandemic and its associated economic fallout created significant financial pressures for transportation providers such as



public transit agencies, commuter railroads and intercity services. While those impacts were severe, Congress demonstrated in 2020 and early this year its commitment to a federal partnership to preserve crucial services and keep construction projects on track. In three separate measures, Congress has supplied significant funding to preserve public transit and Amtrak services and to provide additional capital support to public transit expansion projects. This strong show of congressional support creates a helpful prologue for legislative action expected in 2021.

Even in the midst of the COVID-19 crisis in 2020, the House of Representatives passed a major infrastructure package called the “Moving Forward Act” (H.R. 2). That bill included at its core a five-year reauthorization of federal surface transportation programs. Its purpose was to make transformative infrastructure investments in surface and rail transportation, including high-speed rail systems. The bill proposed a total of \$494 billion over five years (FY 2021 to FY 2025) for federal surface transportation programs. Its largest proposed increases were for passenger rail programs, with a 431% increase as compared to the previous five years. By comparison, transit spending would be increased by 72% and highway spending by 42%.

A major component of H.R. 2 is a revamped passenger rail grant program called Passenger Rail Improvement, Modernization, and Expansion (PRIME) Grants. The PRIME program would direct \$19 billion for high-speed rail and other transformative rail investments. This aggressive proposal to increase passenger rail funding represents a significant policy shift for Congress. While a companion bill to the Moving Forward Act did not reach the Senate floor, it is likely Congress will complete action on a surface transportation and infrastructure package this year.

The election of President Biden has significantly increased that likelihood. A daily Amtrak commuter during his 36 years in the U.S. Senate, he has consistently advocated for passenger rail as a part of a broad infrastructure program during his time in the Senate and as Vice President.

Likewise, his Secretary of Transportation, Pete Buttigieg, was a strong proponent of infrastructure investment during his own presidential campaign. With this kind of leadership, the Biden Administration’s proposed “American Jobs Plan” demonstrates a commitment to increased infrastructure investment in general, and passenger rail in particular.

**“Investment in high-speed rail is a commitment towards reducing our emissions while also providing cleaner, more sustainable transportation. My legislation provides the resources to make these projects successful and help our nation build back better. California is leading this charge with over 5,000 jobs working on 119 miles of construction on 35 sites, and I am proud to reintroduce this legislation to help get the project completed.”**

*— Congressman Jim Costa, (CA-16)*

### A New Federal Policy Framework

Even before the release of its plan, the Biden Administration made clear its interest in a strong partnership with California to develop the state's high-speed rail network. On February 9, 2021, Amit Bose, the Acting Administrator of the Federal Railroad Administration, issued the following statement:

*"America has a chance to lead the world once more through innovation in infrastructure—connecting our communities, creating good jobs, addressing climate change and ensuring equity. Passenger rail development, including world-class high-speed rail, can and must be a part of our strategy to accomplish these goals. As in many other arenas, California has taken the lead nationally to advance high-speed rail, starting an economically transformative project in the Central Valley and assuming the challenges that come with that leadership. The U.S. Department of Transportation looks forward to partnering with California as it leads the way to build back better."*

Other key voices seeking investment in passenger rail are Rep. Jim Costa (D-CA) and Rep. Seth Moulton (D-MA). In 2020, Rep. Costa introduced H.R. 5805, known as the High-Speed Rail Corridor Development Act of 2020, which would both reauthorize the federal High-Speed Rail Corridor Development Program as well as allow the Secretary of the Department of Transportation to create grants for high-speed rail corridor projects. Visit <https://www.congress.gov/bill/116th-congress/house-bill/5805/text> for more information.

In December 2020, Rep. Moulton introduced the American High-Speed Rail Act, which would invest \$41 billion annually over 5 years (\$205 billion total) in grants administered by the Federal Railroad Administration. As part of a coordinated national strategy, the bill aims to reduce strain on our highway and aviation networks through better connecting the America's economic megaregions along national high-speed rail corridors. As Rep. Moulton stated:

*"High-speed rail is faster, cleaner, safer and better for our economy. It will connect people to more jobs in new places, give Americans freedom and choice in how they travel, and put us on par with the rest of the world. This bill is the plan that will get us there."*

With strong support from the House and the Administration, and a history of bipartisan support for infrastructure spending in the Senate, the likelihood of increased federal investment in infrastructure generally, and high-speed rail in particular, is strong.

These types of efforts represent new federal funding opportunities and bring national transportation priorities into closer alignment with California's forward-looking transportation objectives.

## LOCAL AND REGIONAL FUNDING

At the regional and local level, the high-speed rail system will generate local value. We could also seek funding linked to the local value that the railway is generating by focusing on station area value capture and the appreciating real estate values that the system will help create. The full value of the asset will be realized by using innovative methods of value capture, such as secondary use of the system right of way to provide fiber-optic communication connectivity. Ancillary revenues and transit-oriented development will provide further sources of funding that can contribute to system expansion or other costs.

As California's rail and wider mobility ecosystem evolves over time, more people are understanding the value of interconnected transportation as an alternative to traditional, automobile-based transportation. Additionally, advances in trip planning technology have made interconnections with different transit modes easier and more convenient. Such funding could provide for important connections from local transportation and transit to the high-speed rail system to provide a seamless ridership experience. Additionally, as we have seen in Europe and Asia, high-speed rail stations can become a hub for community activity that extends well beyond transportation. Local funds can be used to build out the capabilities of station-hubs into commercial and residential centers.

As a recent example of local and regional support for high-speed rail, the Metropolitan Transportation Commission recently adopted the Plan Bay Area 2050 Final Blueprint. This blueprint includes funding to strategically invest in a coordinated suite of projects that extend the regional rail network and increase frequencies and capacity to address peak-hour crowding. This strategy envisions a new Transbay rail crossing linking

Oakland and San Francisco, with complementary rail extensions connecting Caltrain and high-speed rail to the Salesforce Transit Center, BART to Diridon Station, and the Central Valley to the Bay Area via Valley Link. Furthermore, this strategy funds capital improvements, such as electrification, grade separations and other modernization projects along the Caltrain corridor, prioritizing dual-purpose investments from south to north that help to connect high-speed rail to the Bay Area.

## THE RIGHT TIME FOR PRIVATE-SECTOR FINANCE

The Authority is regularly asked why only federal, state and local funds are being used to build the system and why no private-sector funding is being used. The answer to this is that, generally, private financing (i.e., money provided by privately owned lending institutions such as banks) requires more certainty in both the timing and level of returns from the investment. Returns are highly correlated to the amount of risk that the lender is taking by lending the money. The risk is generally defined as the level of certainty that the lender's investment plus profit will be returned over the forecast time frame. The Authority has validated this statement with the private-sector lending institutions on several occasions. To attract private participation in the funding of the project, the Authority must show greater certainty in project advancement, definition of project configuration, and refined cost estimates that reflect realities on the ground. Therefore, we propose to advance design work in each segment statewide once each segment's environmental work is completed.

Another important consideration is that the scale of investment required to bring the high-speed rail system to operation is generally greater than even the largest private-sector organizations can bear. In general, contracts for public-private partnerships do not typically exceed \$5 billion. This is a general

rule, and larger projects have been proposed, but contracts any larger than \$5 billion generally present too great a risk to any individual company and can limit competition, which is also a critical factor in system cost.

#### **TGV Tours Bordeaux (France)**

The LGV Sud Europe Atlantique line connects Tours and Bordeaux in France. The project was a public-private partnership (P3) structured as a 50-year Design Build Finance Operate and Maintain (DBFOM) project with a capital cost of \$6.9 billion. This is one of the largest P3 transportation projects ever structured. The French government guaranteed part of the private investment, which helped lower the cost of capital and defray part of the financing risk.

In summary, the reason that no private-sector funding is being used is that we are too early in the process and the required investment is too high.

However, once the system is operating and has demonstrated that it is commercially viable over a period of several years, it is then likely that the private sector could be interested in providing financing against the future project revenues that arise from ticket sales and other ancillary revenue streams. Again, the credit quality of this stream of cash flows is critical, which is why any lender would likely need to see several years of demonstrated stable and cash positive operations before lending money to the project.

It is worth noting that financing opportunities naturally lag the system development, which is why it is critical that the state and federal governments continue to support the project in these early stages of development to advance the program into a position where it can generate revenue. The proceeds from private financing could be used to pay for system expansion (to

complete the Bay Area to Los Angeles Basin System or for Phase 2 extensions to Sacramento and San Diego) but would not likely be available for the Initial Operating Segment (which is the first commercially viable segment). The re-engagement of the federal government to support high-speed rail in general, and this program in particular, is a very positive indicator for the private sector as it brings greater guarantees and reduces risk.

### **BUILDING THE SILICON VALLEY TO CENTRAL VALLEY LINE**

Our funding profile means that we must focus on completing the Central Valley segment and meet the federal grant requirements for Phase 1 planning. These actions then ready us to move to the next phase of delivery when funding falls into place.

Upon identifying long-term, stable sources of funds, we will continue to build out the system and will leverage the initial operating line from the Silicon Valley to the Central Valley. With these funds, our goal is to be able to begin serving passengers as soon as possible. However, this is contingent upon the actual funding that we receive and our ability to initiate and complete procurements based upon those funds. As work proceeds to complete this initial line, equal attention will be focused on advancing and extending the system through concurrent investments that provide early benefits. This implementation strategy is laid out in Chapter 4 and prioritizes advancing design work in the full 500-mile system.

A fundamental goal of the program is to create a commercially successful high-speed rail transportation system to connect the state. As segments of the program are delivered, they are projected to generate significant revenues and positive cash flow, which will support private investment.



## **MONETIZING THE SILICON VALLEY TO CENTRAL VALLEY LINE**

Once the Silicon Valley to Central Valley line is built and in operation, it will become a viable commercial enterprise, generating revenue and rapidly producing positive cash flow. Upon demonstrating a level of operational maturity, this positive cash flow can be monetized through financing and private investment, which can then help fund future development of the system. As has been demonstrated in other high-speed rail markets, private-sector operators are expected to invest a considerable amount to own the rights, through a concession, to the long-term operations of a commercially viable high-speed railway. Its value will be greatest when that profitability is proven.

As each incremental section of Phase 1 is constructed, incremental revenue and positive cash flow is generated, which, in turn, can be monetized either through options within an existing concession or through new, larger concessions. Although the timing and value of these sections will be driven by the interest of the private sector, this approach accelerates the completion of the Phase 1 system.

Fundamentally, the concept of monetization means taking the financial value that the system is forecast to generate over a period of time (e.g., ridership generated revenues over 30 years) and having a third party pay an agreed sum of money up front for the right to access that stream of funds. The third party would most likely be a group of banks or large financial institutional investors such as pension funds. The benefit to the Authority is that it can realize the value of the asset immediately and can apply those funds as it deems appropriate.

The value of the upfront payment will be agreed by discounting the future stream of revenues at an agreed discount rate. This discount rate will include not only the cost to the lender to lend the funds, but also an implied risk rate designed to compensate the lender for taking on the risk that those 30 years of revenues will not materialize in the way forecasted. By realizing the funds upfront, the Authority can mitigate its risk on those future cash flows but must pay for the privilege to do so.

In order to finance any investment, it is first necessary to find a lender that is willing to provide the funds under acceptable terms. Once the system is operating and has demonstrated that it is commercially viable over a period of years, it is then likely that the private sector could be interested in providing financing against the project revenues that arise from ticket sales and other ancillary revenue streams.

Again, the credit quality of this stream of cash flows is critical, which is why any lender would need a period of demonstrated stable and cash-positive operations before lending money to the project. From a lender's perspective, there are some significant risks to overcome, such as construction, cultural acceptance, proof of operation, ridership and system safety. We have conducted many discussions with lenders, financiers and other market participants and this feedback has been consistent from all of them. There is absolutely a right time for private finance, but we are not there yet. By financing too early, we are likely to incur a punitive interest rate that reduces its overall proceeds.

## **FULL VALUE OF THE 500-MILE HIGH-SPEED RAIL SYSTEM**

The key to unlocking the full financial value of the high-speed rail system is the ability to connect the megaregions of Southern California and the

Bay Area (Phase 1). By accessing the significant population centers in those regions and providing affordable, sustainable and highly convenient service between the two, significant financial value will be generated within the system. This will primarily be driven by the net revenues generated by operations and by increases in land values around the assets, enhanced tax base, ancillary revenues and increased economic activity.

We do not currently have access to the funds to be able to start or complete Phase 1. This is conventional with large-scale infrastructure projects and the most frequently cited of these is the interstate freeway system.

There are two key sources of funding to help complete Phase 1:

1. The positive cash flow generated from selling tickets and operating the system, which can be leveraged for financing and private investment; and
2. Additional public funds, including federal funds, which can help match project-generated funding.

Although not a source of funding, we will continue working to identify opportunities to reduce costs and to deliver the program more cost-effectively through alternative delivery models, such as public-private partnerships, as we advance the program.

In the long term, the value of the system as a commercial enterprise will be significant for the State of California. After completion of the Phase 1 system and its first operating concession period, the State will have a fully developed and operable asset that it can continue to monetize over successive 20- to 30-year periods to generate funds for reinvestment, expansion (e.g., for Phase 2 extensions) or other purposes.

Connecting the high-speed rail system with statewide planned transportation networks will generate further value. This connection will increase network integration and enhance the user experience, which typically generates higher ridership. Similarly, planned connectivity to intra-state transportation networks will also enhance the high-speed rail system's value. Not only this, but as new technology is developed and brought to market, it can replace older technology. This is because the fundamental value of the system lies in the contiguous right of way that the state has developed.

Lastly, delivering the project cost effectively is of equal importance to securing additional funding. Alternative delivery models (such as public-private partnerships) will be utilized when appropriate to help reduce both capital and operating costs. After initial start-up costs, it is expected that cost efficiencies will increase as the high-speed rail industry grows in strength and maturity in California and the United States as a whole, and as competitive pressures continue to drive industry costs down. Using these types of delivery models can also help accelerate the construction schedule, which will help reduce costs and risk to the State.

California's high-speed rail program is unique in its magnitude and its complexity. At the same time, we are funding and implementing it in the same way that high-speed rail systems have been, and continue to be, developed throughout the world. Specifically, we have a clear, long-term vision and a long-term plan for implementing that vision. We are advancing it through a series of phases allowing for incremental extensions. That is the implementation strategy that we laid out in our 2012 Business Plan and that we continue to follow. We will fund and build it in a series of overlapping, not sequential, phases, just as other systems around the world are funded and built.

## CAPITAL COST ESTIMATES FOR FULL 500-MILE SYSTEM

The capital cost estimates shown for the remaining system beyond what is currently funded have not fundamentally changed from those presented in the February 2020 Draft Business Plan. All project sections beyond the 119-mile Central Valley segment are still in conceptual engineering. Updates will be made when segments undergo further design after Records of Decision are completed. As design advances, the corresponding estimates will be updated in future Business Plans and Project Update Reports.

### BUSINESS PLAN ESTIMATES DIFFER FROM ENVIRONMENTAL ESTIMATES

Capital cost estimates shown in draft environmental documents intentionally do not align with the capital cost estimates shown in this 2020 Business Plan. The estimates in the environmental documents reflect a larger project footprint adequate to allow for further project refinement through the completion of advanced design. This larger footprint allows the Authority to evaluate the maximum potential impact the project may have to the natural and built environment. This provides transparency to the public and mitigates the risk of future supplemental environmental reviews, adding time and cost prior to construction. This results in a more conservative and typically higher cost.

Business Plan estimates incorporate design optimization and alternative construction measures through a series of workshops assessing scope options, cost trends and other factors specific to each geographic section. These measures can include optimizing structural design criteria, footprint refinements, lower profiles for structures, modular design for stations and constructability mitigations. When combined, these can result in a lower cost estimate.

In addition, environmental estimates are based on project section boundaries that may overlap between adjacent segments. When added together, this may result in “double counting” costs. The section costs developed for the Business Plan are specific to each project segment and do not overlap.

### COST ESTIMATES SHOWN IN RANGES BASED ON LEVEL OF DESIGN AND RISK

In our 2018 Business Plan, we introduced showing capital cost estimates in ranges, given the level of design that had been completed. A range is the appropriate way to present these estimates, given that costs will continue to evolve and change as more information becomes known and as more decisions are made by the Board of Directors. The current level of design certainty is relatively low on the alignments beyond the Central Valley 119 miles. It is only slightly more certain on the segments that have been environmentally cleared—the Merced and Bakersfield extensions.

The environmental reviews on these project sections are still underway and final route decisions will not be made until they are environmentally cleared. As environmental reviews proceed, alignments and impacts will continue to evolve through collaboration with stakeholders and the public. Changes in scope and even changes in preferred alternatives are possible. To reflect that, we are maintaining a base cost estimate with a wide range. These ranges capture the potential costs associated with final alignment decisions and remain appropriate at this step of project development and decision making.

### Developing and Applying Risk Ranges

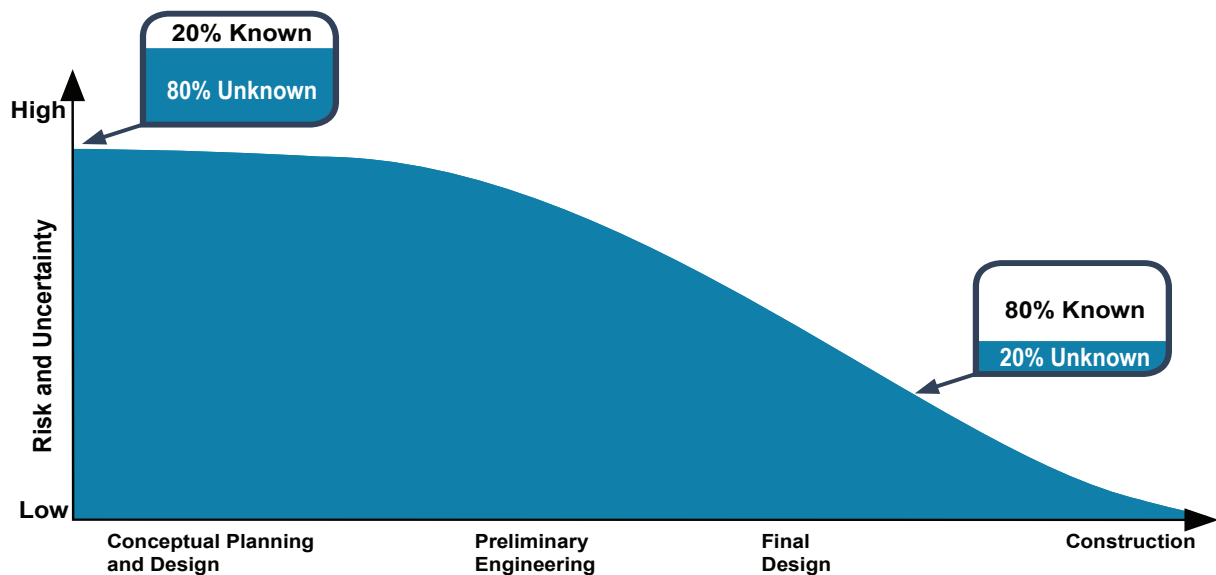
**Exhibit 5.5** illustrates how risk and uncertainty change over a project’s life cycle, and, with that, costs become more certain and ranges become narrower. The costs for the 119-mile Central Valley Segment, where construction is well underway, fall

to the right side of the exhibit. This illustrates that risks are more fully understood and accounted for and, because of that, there is greater certainty on the cost to complete the project.

Costs for the remaining six project sections lie more toward the left side of the graphic. This reflects that more design is required. The level of

uncertainty varies depending on the status of the environmental work on a segment. It also reflects that until more is known through advanced engineering, there remains greater uncertainty about potential risks and costs. This cost/risk uncertainty is captured and reflected in the wider range of cost estimates.

**Exhibit 5.5: Risk and Uncertainty Timeline**



The ranges established for each project section are based on industry standards that reflect the current level of design development. The ranges are based on estimate classifications by AACE International (Association for the Advancement of Cost Engineering) and vary depending on the complexity of the project scope elements, maturity of underlying technical baseline information and the inclusion of appropriate contingencies. The ranges assume a general level of risk based upon each project section's level of development, which was applied as an overlay to the estimate.

### **CURRENT ESTIMATES TO COMPLETE THE STATEWIDE SYSTEM**

This section presents the estimates to complete the entire Phase 1 system from San Francisco to Los Angeles/Anaheim. The estimates assume

connecting the Central Valley to the Bay Area first followed by connecting south to the Los Angeles Basin. However, as design advances, the Authority will consider a range of factors in consultation with partners and stakeholders, including project readiness and funding availability, to assess how to move forward with construction.

The estimates shown on the next page have been updated since the Draft 2020 Business Plan was issued for public comment in February 2020. They reflect the Central Valley cost changes described in Chapter 3 and the changes in implementation strategy described in Chapter 4, including the proposal to phase track installation and to advance design on remaining project sections. In addition, regional bookend project costs and costs to complete environmental documents, which were



previously carried in the project section costs, are now accounted for in the Program Baseline and have been removed from the section cost estimates.

**Table 5.5** summarizes the cost estimate ranges by project section in year of expenditure dollars. The Merced to Bakersfield Line estimates are a summary of current program commitments and priorities. The ranges reflect that the cost estimates for segments are at a very early stage of design. The

ranges vary based on the current cost estimating risk and uncertainty specific to each project section. Also included are the assumed additional trainsets, stations, all rail systems and construction of necessary operations and maintenance facilities.

The changes to section costs and how they are derived are detailed in the Capital Costs Basis of Estimate Report at [https://hsr.ca.gov/docs/about/business\\_plans/2020\\_Business\\_Plan\\_Capital\\_Cost\\_Basis\\_of\\_Estimate\\_Report.pdf](https://hsr.ca.gov/docs/about/business_plans/2020_Business_Plan_Capital_Cost_Basis_of_Estimate_Report.pdf).

**Table 5.5: Remaining San Francisco to Los Angeles/Anaheim Section Cost Ranges (\$ in Millions YOY)**

Segment	Low	Base	High
<b>Merced To Bakersfield Line</b>			
Updated Program Baseline plus Program Enhancements		18,250	
Merced and Bakersfield Extensions* (single track, four trains, four stations)		3,071 – 4,514	
<b>Subtotal</b>	<b>21,321</b>	<b>21,321 – 22,764</b>	<b>22,764</b>
Merced to Bakersfield (future second track)	1,106	1,106	1,106
<b>Northern California</b>			
San Francisco to San José	1,307	1,649	2,123
San José to Gilroy	2,162	3,194	4,633
Gilroy to Carlucci Road (connection to Central Valley)	7,871	10,397	12,789
Central Valley Wye Balance	1,842	2,240	2,601
Advance Design Costs	0	213	0
<b>Southern California</b>			
Bakersfield to Palmdale	12,601	15,684	18,901
Palmdale to Burbank	12,635	16,775	24,428
Burbank to Los Angeles	1,161	1,360	1,571
Los Angeles to Anaheim	2,478	2,918	3,352
Advance Design Costs	0	382	0
<b>Other System Costs</b>			
Heavy Maintenance Facility Balance	433	481	529
Trainset Balance	4,161	4,643	5,084
<b>Phase 1 Cost Range</b>	<b>69,078</b>	<b>82,363 – 83,806</b>	<b>99,881</b>

Note: Numbers may not sum due to rounding.

\* Merced and Bakersfield Extension costs are shown in a range pending advance design work.





Photo: Construction progress underway from Avenue 12 in Madera County



**Exhibit 5.6** shows the construction cost estimates and the schedule for completing environmental review for the full 500-mile system by project section. The estimates represent the base costs shown in **Table 5.5**.

Costs will be updated as sections move through design. Year of expenditure costs will be updated when there is greater certainty regarding the

availability of additional funding and a clearer picture of when construction can begin. We will continue to evaluate all funding avenues and continue the work to prepare segments for construction. We look forward to working with the Legislature, the federal government and our stakeholders to find opportunities to fund and build the system.

**Exhibit 5.6: Environmental Schedules and Cost Summary by Segment<sup>1</sup>****NORTHERN CALIFORNIA<sup>2</sup>****San Francisco to San Jose****43 miles****Capital Cost:** \$1.6 billion**EIR/EIS Complete:** Q2 2022**San Jose to Carlucci Road****88 miles****Capital Costs:** \$13.6 billion**EIR/EIS Complete:** Q1 2022**CENTRAL VALLEY****Merced to Madera<sup>3</sup>****33 miles****Capital Cost:** \$2.3 billion\***EIR/EIS:** Complete

\*Includes partial funding for Central Valley Wye

**Madera to Poplar Avenue<sup>3</sup>****119 miles****Capital Cost:** \$13.8 billion**EIR/EIS:** Complete**Funded/Under Construction****Poplar Avenue to Bakersfield<sup>3</sup>****19 miles****Construction Cost:** \$1.2 billion**EIR/EIS:** Complete**Central Valley Wye Balance****28 miles****Capital Cost:** \$2.2 billion**EIR/EIS Complete:** Complete**Notes:**

1. Final segment miles dependent on completion of environmental documents

2. Additional statewide funding:

- a. Caltrain Electrification- \$714 million
- b. San Mateo Grade Separation- \$84 million
- c. Rosecrans/Marquardt Grade Separation- \$77 million
- d. Los Angeles Union Station- \$423 million

3. Cost estimates are for single-track; an additional \$1.1 billion is required to add second track on the 171-mile Merced-Bakersfield line.

**SOUTHERN CALIFORNIA<sup>2</sup>****Bakersfield to Palmdale****79 miles****Capital Costs:** \$15.7 billion**EIR/EIS Complete:** Q2 2021**Palmdale to Burbank****41 miles****Capital Costs:** \$16.8 billion**EIR/EIS Complete:** Q4 2022**Burbank to Los Angeles****13 miles****Capital Costs:** \$1.4 billion**EIR/EIS Complete:** Q4 2021**Los Angeles to Anaheim****31 miles****Capital Costs:** \$2.9 billion**EIR/EIS Complete:** Q4 2022 - Q2 2023





Rendering: Artist concept of high-speed rail platform



# REFOCUSING THE ENTERPRISE ON RISK MANAGEMENT

The emergence of the COVID-19 pandemic in early 2020 created a variety of new and unforeseen risks, neither anticipated nor planned for. As discussed in Chapter 2, the pandemic affected how we conduct business, interact with the public and build high-speed rail. Although we responded to its immediate impacts quickly, the full magnitude of the pandemic and its duration are still unknown, even with the recent vaccine approval and accelerated rollout. Given this uncertainty, there still may be possible residual impacts at a macro-economic perspective from the ongoing risk of exposure, mandatory shelter-in-place orders and potential shutdowns. Under this new global risk overlay, we have enhanced our risk assessment efforts.

Risk is inherent to any large-scale capital program. Actively managing risk is critical to objectively frame and guide decision making at all levels of the organization and to achieve the program's strategic objectives. The process of identifying, defining and quantifying risks is iterative, as is developing adequate risk mitigation strategies and management actions.

The Authority has been engaged in this iterative process since its inception, gradually increasing its understanding of current and future program risks and is now pivoting to take a more formal and systematic approach to risk management. The key risks identified in this chapter are high priorities

and our mitigation strategies largely remain the same. However, the pandemic has driven us to develop an enhanced view of risk and risk management.

This 2020 Business Plan identifies three ways the Authority intends to further address risks facing the project.

- First, increasing the risk contingency for the construction work underway in the 119-mile Central Valley Segment as described in Chapter 5.
- Second, implementing an Enterprise Risk Management program and creating a Risk Management Office under new leadership, which is described in this chapter.
- Third, developing a Stage Gate project development and delivery process to provide more rigor and focus on risk-informed decision-making at every stage of project development, also described in this chapter.

## CHAPTER 6

**Enterprise Risk Management (ERM) Defined**

Standard-setting bodies, such as the Committee of Sponsoring Organizations of the Treadway Commission and the International Organization for Standardization, provide several definitions of Enterprise Risk Management.

In summary, Enterprise Risk Management can be defined as the culture, capabilities and practices that organizations apply in setting and carrying out the enterprise strategy with the purpose of actively managing risk to realize and preserve value.

It is important to note that Enterprise Risk Management is not simply an inventory of risks within the Authority and that it is also broader than the Authority's system of internal controls. The principles apply at all levels of the organization and across all functions covering strategy setting, governance, internal processes, organizational structure and capabilities, data and analytics, communication and performance metrics.

Enterprise Risk Management is intended to be fully integrated with an organization's structure and system of governance to enable risk-based decisions and provide reasonable assurance to the Board regarding the achievement of the enterprise objectives.

## Implementing Enterprise Risk Management

The Authority's Form-to-Function proposal, authorized with the passage of the FY20-21 State Budget, included the creation of a Risk Management Office, led by a Director of Risk Management and Project Controls. This independent office reports directly to the Board, and, in September 2020, a new director was appointed, and work began to enhance risk management oversight and develop the Authority ERM Program.

One of the key aspects of this framework will be the creation of an Enterprise Risk Committee, an oversight body comprised of members including the Chief Executive Officer, the newly appointed Director of Risk Management and Project Controls, and other Authority executives. The Enterprise Risk Committee will evaluate and prioritize emerging risks, review management risk responses and provide transparent reporting. The committee will be administered by the Risk Management Office and there will be standardized tools to review and evaluate emerging trends, prioritize reviews, review management's responses and recommend risk actions.

**Exhibit 6.0** is portrayed in a circular fashion as it is intended to represent a cohesive, collaborative, cross functional and inclusive risk organization.

**Exhibit 6.0:** Enterprise Risk Committee

The Authority is undertaking the establishment of an Enterprise Risk Management program to provide leadership with the framework and knowledge to identify and evaluate emerging risks to further the goals and objectives of the Authority. The framework will build upon our current risk management practices and advance those practices to a Target Operating Model. Underpinning this model is a strong emphasis on the Committee of Sponsor Organizations of the Treadway Commission internal controls framework in use across all State of California agencies, as well as leading-edge International Organization for Standardization (ISO) 31000 best practices.

The program will provide a range of benefits including:

- Improving the Authority's ability to identify, plan management actions and respond to risks that can originate from many parts of the organization and impact other parts;

- Improving the line of sight of executive leadership, which reduces surprises and allows the organization to take advantage of potential opportunities and mitigation strategies;
- Facilitating internal communications and collaboration by establishing a common language of risk that cuts across disciplines, organizational silos, consultant teams and geographies;
- Improving transparency and traceability of data inputs, outputs and forecasts;
- Improving stakeholders' management and communications; and
- Providing reasonable assurance to the Board that the Authority is achieving its enterprise risk objectives.

## ENTERPRISE RISK MANAGEMENT PLAN

The Enterprise Risk Management program integrates risk management into all significant activities and functions of the Authority, supplementing and augmenting every aspect of our organization to empower and support our people in continuously improving our understanding and management of risk. The Risk Management Office has started to develop a comprehensive program.

The overall framework of this program was presented to the Board of Directors in December 2020 as provided here:

[https://youtu.be/KT1cq1RC\\_3k](https://youtu.be/KT1cq1RC_3k)



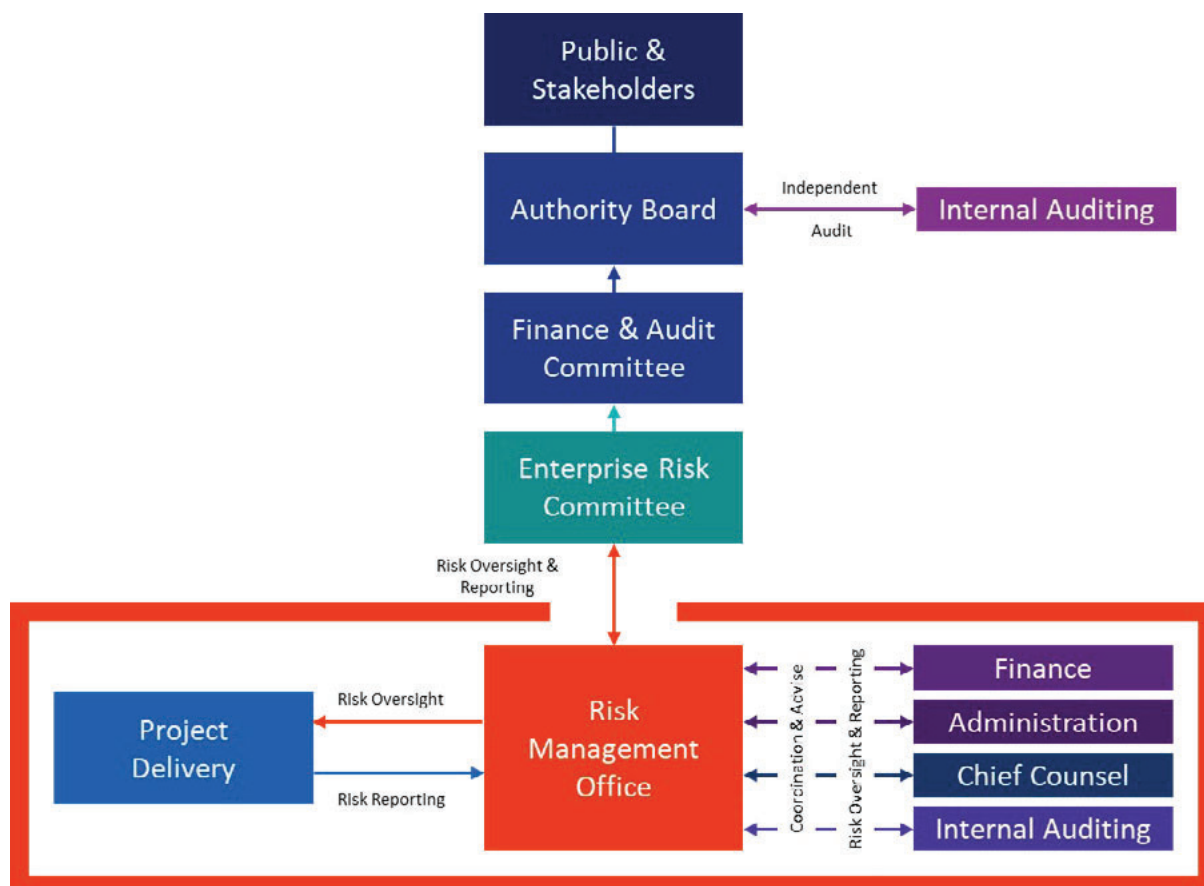
**Exhibit 6.1** outlines the Enterprise Risk Management governance and reporting structure. Reporting is intended to be both bottom-up and top-down to drive communication and increase transparency and accountability. The resulting risk information will flow through the executive team and the Board of Directors and provide Authority stakeholders information on program risks, their status and mitigation approaches.

The bottom of the graphic reflects the role of the Risk Management Office, which is responsible for establishing the tools, templates and processes for data to be gathered and reported. Each functional group within the Authority is responsible for its respective business risks and for implementing the necessary controls and risk response. The functional groups will provide this information to the Risk Management Office to ensure consistent reporting and for identification of potential cross-

program impacts. Further, the Risk Management Office will work collaboratively with the Audit Office and the Quality Section to share information and collaborate on various issues. In addition, the Risk Management Office will play an oversight role and provide training, guidance and support to the various functional areas.

Once the program is up and running, a standard risk report will be prepared for the Enterprise Risk Committee to stay informed and review management actions on key prioritized risks—the culmination of all this work will then be reported to the Board of Directors on a regular basis. The current project development and construction risk reporting will continue. Updated risk reporting will be enhanced over time and incorporated into the new Enterprise Risk Management program framework.

**Exhibit 6.1: Governance and Reporting Structure**



## New Stage Gate Approach to Project Delivery

The Authority is implementing a new Stage Gate process to strengthen our project development, project delivery and risk management processes. Stage Gate processes are often followed as a best practice in both the public and private sectors because they bring greater rigor, oversight, accountability and transparency to project development and delivery.

Stage Gate is a valuable part of project governance because it provides decision makers with comprehensive, thoroughly documented and validated information to support fully informed decisions. Stage Gate will also serve as the organizing framework for our capital budget approval process moving forward. We developed our Stage Gate process, in part, in response to the lessons learned from advancing Central Valley construction before appropriate pre-construction activities were completed.

As projects move through Stage Gate, designs are advanced and scopes are defined at increasing levels of three-dimensional detail. For example, the guideway will be defined by its geographical boundaries (north, south, east, west) and its vertical characteristics (elevated, surface, tunnel). This informs critical pre-construction activities (right-of-way needs, utility relocation requirements, third party agreements and environmental permits) so that these elements are configured concurrently before construction contracts are awarded. This reduces the risk of needing to reconfigure designs during construction, which can trigger inefficient and costly delays.

Currently, we have developed a framework policy and process that lays out a sequence of stages and gates. Each gate represents a key decision milestone or transition point. Specifically:

- “Stages” represent a specific phase of project development or construction along with the activities carried out in that stage, ranging from project initiation to project close out.
- “Gates” are major milestones at which a formal decision is made on a project’s readiness to advance to the next stage and to inform financial affordability.

The policy is being designed so that every project follows a set process that:

- Applies criteria to determine whether a project should advance to the next stage;
- Drives alignment of critical project elements and scope definition through detailed configuration;
- Includes a systematic refinement of cost estimates and schedule at each stage;
- Assesses the risks and benefits of moving to the next stage; and
- Evaluates whether the project has completed the requirements for that specific stage.

While the process will be structured, it will also provide flexibility to evaluate and select the appropriate project delivery/procurement strategy, such as design-build, design-bid-build or other approaches.

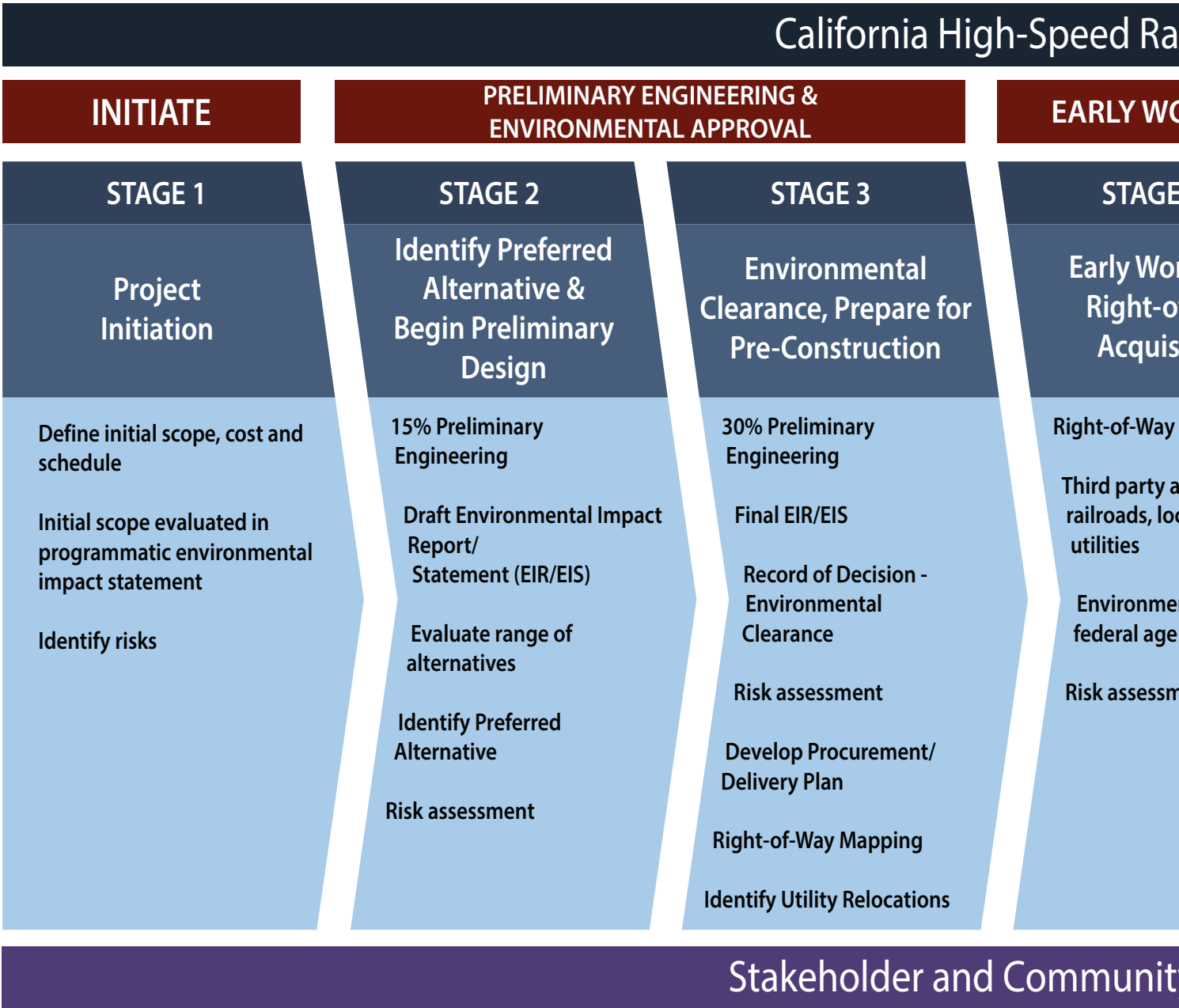
As we advance capital projects through the Stage Gate process, we will do so with an integrated, multidisciplinary team and the Authority’s regional teams that engage with local communities and stakeholders.

STAGE GATE FRAMEWORK

Projects will advance through seven stages, as shown in Exhibit 6.2. Projects already underway will be grandfathered into the appropriate stage. The framework generally illustrates a design-build

project delivery approach; however, as shown in Stage 3, the Authority will formally evaluate what is the most appropriate project delivery method for each specific project or project element.

Exhibit 6.2: The Stage Gate Process

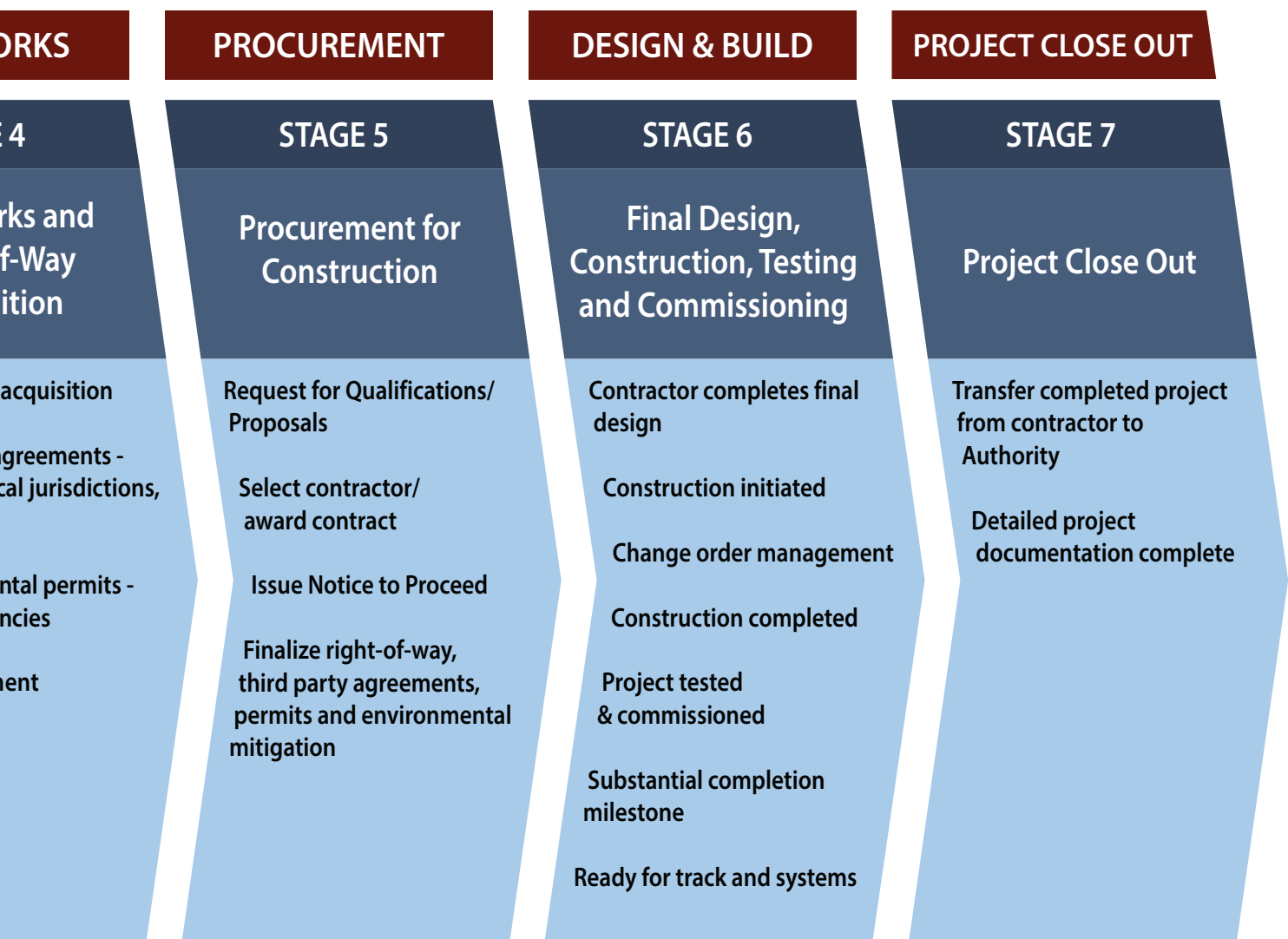


### STAGE 1: PROJECT INITIATION

In this stage, projects typically are, or already have been, evaluated as part of a broad programmatic environmental review process. The 500-mile system from San Francisco to Los Angeles/ Anaheim plus extensions to San Diego and Sacramento have already been evaluated in a Tier 1 programmatic EIR/EIS jointly prepared by the Authority and the FRA.

In Stage 1, a range of issues are considered, including the project's objective, scope, timing and funding, risks and mitigations. A business case for the project is developed, which will undergo formal review and approval consistent with the Authority's governance process.

## High-Speed Rail Stage Gate Process



## Community Engagement



## **STAGE 2: PREFERRED ALTERNATIVE AND PRELIMINARY ENGINEERING**

In Stage 2, alternative design options are developed and evaluated as the project advances into a more detailed Tier 2 project level environmental review process. A preferred alternative, such as a specific route or facility location, will be identified. The project design is advanced to approximately 15 percent and a Draft Environmental Review/Environmental Impact Statement is issued for public comment. The project team will prepare an updated cost estimate and schedule. Risks and potential mitigation strategies are further developed along with a confirmation of project affordability.

## **STAGE 3: PREPARATION FOR EARLY WORKS AND ENVIRONMENTAL CLEARANCE**

In Stage 3, the project is environmentally cleared through a Record of Decision/Notice of Determination and an environmental mitigation and monitoring plan is prepared, along with a strategy to obtain the necessary environmental permits. In this stage, project engineering also advances from 15-percent to 30-percent design.

In this stage, the project's footprint is established, also referred to as configuration management, which includes the width of the alignment and specific locations where it will run on the surface, on elevated structure or in tunnels. Right-of-way will be mapped, and utility relocation requirements will be identified. This sets the baseline for subsequent work and for potential future changes that might be made through the Authority's change-management process. A comprehensive review of the project scope, cost and schedule is conducted, and a risk analysis is conducted to further identify and quantify discrete cost and schedule risks and uncertainties associated with the scope.

The Authority will assess what delivery method is most appropriate for the project, including design-build, design-bid-build or another alternative delivery method, and develop a project delivery/procurement plan for the project or specific project elements. Completing Stage 3 positions the Authority to begin planning and preparing for pre-construction activities, also referred to as early works.

## **STAGE 4: EARLY WORKS AND RIGHT-OF-WAY ACQUISITION**

This is a key project development stage that is critical for effectively managing scope, schedule, budget and risk in future design and construction stages. The Authority will begin acquiring right-of-way, negotiating agreements with third parties, such as local jurisdictions, utilities and freight railroads, and securing the necessary environmental permits from federal and state agencies before initiating construction. At the end of this stage, a detailed plan will be in place to ensure that right-of-way acquisition, agreements and permits are sufficient to enable construction to start.

The risk assessment is updated to further identify and quantify cost and/or schedule uncertainties. Procurement documents are finalized, and a comprehensive review of the contract scope, cost and schedule will be performed to validate the contract's reasonableness and to ensure the risks retained by the Authority, versus those risks contractually transferred to the contractor, are fully understood.

### **STAGE 5: PROCUREMENT FOR CONSTRUCTION**

In Stage 5, the focus is on construction procurements. The Request for Qualifications (RFQ) and Request for Proposals (RFP) are developed and issued; proposals and bids are evaluated; and a contractor will be recommended to the Board of Directors. Upon Board approval, the contract will be awarded and Notices to Proceed (NTP) will be issued.

At the end of this stage, right-of-way acquisition, third-party agreements, permits and environmental mitigation will have advanced enough to enable construction to start and not to delay work on the project once construction begins.

### **STAGE 6: FINAL DESIGN, CONSTRUCTION, TESTING AND COMMISSIONING**

In Stage 6, based on the procurement/delivery strategy identified, various contractors will complete detailed final design and construct the project(s) based on that design. This will include constructing the civil infrastructure, installing track and systems, and associated operations facilities, such as maintenance-of-way facilities. As construction advances, change orders will

be identified, costed and negotiated to address changes in scope, unforeseen conditions and other issues that come up during construction. This stage culminates with the project built, tested and commissioned, fulfilling the “substantial completion” milestone, which is one of the more significant milestones in an infrastructure project.

### **STAGE 7: PROJECT CLOSE-OUT**

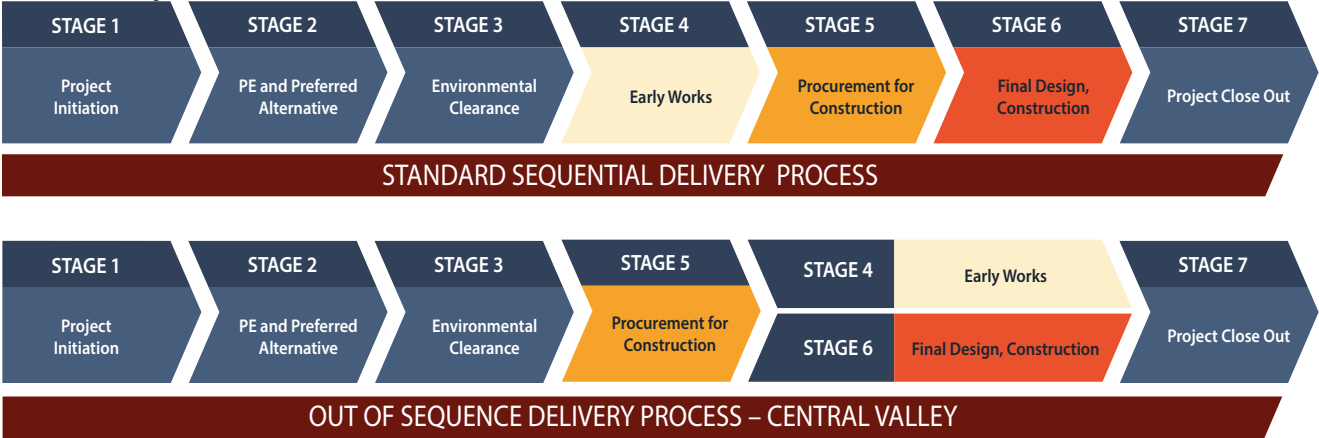
In Stage 7, planning, design and construction are complete and the project proceeds through final acceptance by the Authority for operations, including the development of several key acceptance documents.

HOW STAGE GATE PROCESS REFLECTS LESSONS LEARNED

As we have frequently noted, the federal American Recovery and Reinvestment Act came with a strict deadline to fully spend the grant funds by September 2017. To meet that deadline, the Authority moved into construction on the 119-mile Central Valley Segment before completing pre-construction activities, including right-of-way acquisition, utility relocations and third-party agreements.

These activities were conducted out of the correct sequence, as shown in **Exhibit 6.3**, which created many cost and schedule risks that we have endeavored to manage over the last two years. By taking Stage 4, Stage 5 and Stage 6 out of order, the project was impacted by schedule delays and cost increases. We are putting these legacy risks behind us. Going forward, projects will be developed through the correct Stage Gate sequence so that we avoid those risks in the future.

Exhibit 6.3: Correct Sequential Delivery Process compared to Out of Sequence Process in the Central Valley



Funding Risks

The availability of sufficient funds presents one of the largest challenges to the delivery of the high-speed rail program. As we have described in detail in Chapter 5, Costs and Funding Update, access to an ongoing, stable funding stream affects our ability to complete the Silicon Valley to Central Valley line and, ultimately, the remaining San Francisco to Los Angeles/Anaheim system. This will continue to impact the cost of the program as inflationary escalation is periodically added to remaining segment costs until funding has been identified for construction.

Although funding to complete the remaining Phase 1 system and the Silicon Valley to Central Valley line has yet to be identified, the current

revenues are enough to complete the Central Valley Segment, the bookend investments in Northern and Southern California, and all environmental documents for Phase 1. The summary below presents the risks associated with the current funding resources available.

STATE FUNDING RISKS

Currently, the State has two major funding sources for the high-speed rail program. The first primary source, and largest, is Proposition 1A, which was approved by the voters in 2008 and authorized by the Legislature in 2012. The second primary source is a one-time and ongoing 25 percent appropriation of Cap-and-Trade proceeds through 2030. For a more detailed description of funding, see Chapter 5, Costs and Funding Update.

## ■ PROPOSITION 1A

The Legislature has not yet appropriated the remaining \$4.2 billion in Proposition 1A funds. The Authority plans to submit a Proposition 1A Funding Plan to the legislature in tandem with this Business Plan to request access to the balance of bond funds for the purposes of continuing Central Valley construction and advancing environmental and design on identified usable segments.

We will continue to work closely with the Governor's Administration, the California Department of Finance and the Legislature on the appropriation to assure that the remaining Proposition 1A funds are available to maintain the current project schedule. Funding delays could affect project cash flows, which will directly impact the project's delivery schedule.

Upon appropriation of Prop 1A funds, we will work in close coordination with the Department of Finance and the State Treasurer's Office to facilitate Proposition 1A bond sales to meet project cash flow needs. Staff maintain detailed critical-path timelines that describe the requirements to secure approval for accessing the remaining Proposition 1A funds.

If access to bond funds is subject to delay, Cap-and-Trade funds could provide limited cash flow funding. However, construction work would have to be significantly reduced or stopped without access to remaining bond funds for the 2021-22 fiscal year.

## ■ CAP-AND-TRADE

The Cap-and-Trade Program provides a source of funding to the high-speed rail program through 2030. The primary risk to Cap-and-Trade funding is that receipts are volatile and can be lower than forecast. Cap-and-Trade is an auction-based revenue source that is contingent upon market factors, and as such it is difficult to predict with certainty the results of future auctions. This creates

challenges when planning for projects that are dependent on Cap-and-Trade revenues.

Proceeds for May 2020 were \$6.2 million—which is a direct result of the impact of the COVID-19 pandemic. However, as noted in Chapter 5, Costs and Funding Update, there is reasonable possibility that the Authority could receive revenues from these current unsold allowances in the future. The Cap-and-Trade Program's overarching goal is to reduce greenhouse gas (GHG) emissions. Therefore, the number of allowances and prices may change as industries make longer term investments to meet reduction targets—this could result in lower fund revenues. Conversely, the reduction in the number of allowances sold over time could increase the price of remaining allowances. Independent forecasts indicate that the decrease in allowance supply and increased allowance price could result in higher fund revenues.

Previously, we have raised the potential for a fixed annual receipt of Cap-and-Trade proceeds guaranteed by the State of California that would provide greater certainty and allow us more flexibility in applying those funds to long-term contracts. It would allow us to more accurately plan for future expenditures. Current mitigations include cash management and planning, but this may not be sufficient for large procurements that depend on multiyear Cap-and-Trade revenues.

We assess each Cap-and-Trade auction result and actively manage commitments of Cap-and-Trade funds. Additionally, over the previous cycles we have developed significant intelligence relating to the structure of the auction systems.

For planning purposes, and as documented in the 2018 Business Plan, we assume average receipts in a range of \$500 million to \$750 million annually moving forward. This assumption is supported by the California Legislative Analyst's Office, which published the Cap-and-Trade Extension: Issues



for Legislative Oversight report in December 2017. The Authority has enhanced these forecasts by developing a dynamic forecasting model that tracks Cap-and-Trade allowances. Since the enactment of AB 398 (Statutes of 2017), the Authority has received approximately \$719 million annually through the February 2020 auction.

## FEDERAL FUNDING RISKS

We have two funding agreements with the Federal Railroad Administration (FRA), totaling approximately \$3.5 billion. These funds have been at risk since the FRA's May 2019 letter terminating the FY10 grant agreement. This has affected both grant agreements—ARRA and FY10—and is an ongoing funding and litigation risk.

### AMERICAN RECOVERY AND REINVESTMENT ACT GRANT (ARRA)

In cooperation with the FRA, we met the ARRA federal grant expenditure deadline of September 2017. Currently, we are fulfilling its state match obligation under the agreement's tapered match provision, which allowed all ARRA federal funds to be expended first followed by state match requirements.

As of November 2020, the Authority has identified state expenditures to match 99.5 percent of the state funds necessary to meet its ARRA match obligation. The federal government indicated in its February 2019 letter that it may consider additional action to reclaim already expended ARRA federal funds. This action would likely result in additional litigation and could have other financial impacts to the State of California. We look forward to working collaboratively with the new federal administration in 2021 to remove this risk.

### FISCAL YEAR 10 GRANT (FY10)

The FRA de-obligated the \$929 million provided in the FY10 grant agreement in May 2019. The

State of California filed a legal suit to stop this action. Currently, the future of federal FY10 funds remains at risk. However, the Authority has been in communication with the Biden Administration about this issue. We are optimistic that an agreement can be reached to preserve this funding for the project.

## Litigation Risks

A program of this nature will experience many different legal risks. These include potential litigation and adjudicatory administrative processes related to project funding, environmental clearances, property acquisition and contract disputes. Previous litigation already affected the Central Valley Segment construction costs and schedules.

### PROPOSITION 1A LEGAL CHALLENGES

*John Tos, et al. v. California High-Speed Rail Authority – Third District Court of Appeal, filed May 2019*

The lawsuit is related to two Proposition 1A bond funding plan actions approved by the Board of Directors for the San Francisco to San José corridor electrification project and the Central Valley construction segment. These funding plans allow Proposition 1A bonds to be sold and the funds used for these capital projects. The lawsuit alleges that the Legislature violated the California Constitution when it passed Assembly Bill (AB) 1889 (2016) because AB 1889 materially modified Proposition 1A without voter approval.

AB 1889 states that a corridor or usable segment is "suitable and ready for high-speed trains to operate immediately or after additional planned investments are made on the usable segment and passenger train service providers will benefit from the project in the near-term." Plaintiffs asked the court to declare AB 1889 unconstitutional. Plaintiffs also alleged that the two funding plans approved

by the Authority, and the associated independent consultant reports, failed to meet a number of the requirements of Proposition 1A.

In November 2018, the Superior Court ruled in the Authority's favor, finding that AB 1889 was constitutional. Plaintiffs conceded that if AB 1889 is valid, the funding plans are also valid. All parties stipulated to enter a final judgment in the Authority's favor. The case was appealed by Tos, et al, in May 2019. The appellate case is fully briefed, and the parties await a decision. The Authority is being represented by the State Attorney General's office in the appeal.

## FUTURE LITIGATION

Given the magnitude of the project and the broad base of stakeholders, we recognize that similar litigation on other project sections or new litigation may arise in the future. As the program advances, the Authority will work closely with affected stakeholders to address issues before they become formal lawsuits. In addition, we will continue the practice of using alternative dispute resolution processes, such as mediation or arbitration, where possible.

### PROPOSITION 1A COMPLIANCE WITH PROPOSED INTERIM SERVICE BETWEEN MERCED AND BAKERSFIELD

The Authority recognizes that its implementation strategy for interim high-speed rail service connecting Merced, Fresno and Bakersfield may expose the Authority to potential litigation over Proposition 1A compliance. The risk comes from the fact that Proposition 1A asks the Authority to develop funding plans that show that passenger service provided by the Authority, or pursuant to its authority, will not require an operating subsidy. Opponents of the project suggest that the Authority's implementation strategy violates that language in the Bond Act and the High-Speed Rail Act.

The Authority believes that there will be no violation of the subsidy language because the Authority's implementation strategy for the Central Valley segment is to lease its track and rail cars to another public entity that is already providing passenger rail service in the Central Valley. During this interim service period, the Authority will not be responsible for operating costs and, therefore, will incur no subsidy for its operation. The entity leasing the assets from the Authority will bear the revenue risk as it pays a fixed lease fee and receives revenue from the operations and a lower than current subsidy from the State.

This service would be structured similarly to the way the Legislature has structured the bookend projects. For example, Proposition 1A monies are currently being used to electrify the Caltrain corridor, and Caltrain receives public subsidies. In the same way, the Authority's approach proposes that the current subsidy being paid in the Central Valley will continue, although at a much lower amount for other services that will lease assets from the Authority. This will put completed infrastructure into service with greater benefits to passengers while the interim service is being run.

The Authority is confident that it will prevail in future litigation touching on these areas.

## Stakeholder Support Risks

Public support has remained at a consistent level throughout the duration of the project since Proposition 1A was passed. Most recently, a 2018 Public Policy Institute of California (PPIC) Poll found that many Californians (53 percent) supported the project. It is imperative that we continue to work diligently with the communities and stakeholders along the alignment and statewide to ensure that accurate information is provided. Maintaining strong public support at all levels through education and outreach is vital to the program's success.

If we do not clearly articulate the program's benefits, plans, costs and impacts, support could weaken. As well, if we agree to design or other project modifications without first determining their overall program implications, there is a risk that public support will erode due to increased costs. Conversely, if the changes are not accepted it could lead to local community opposition. Both could affect the program's schedule and costs.

Communication with external entities is a responsibility managed at all levels within the organization, both at a statewide and regional level. At the state level, ongoing communication with legislators, stakeholders and state agencies ensures that current and factual information is shared. Similarly, at the federal level, our staff, as well as staff at the California State Transportation Agency (CalSTA), maintain an ongoing line of communication with members of Congress and their staff and with federal agencies.

At the statewide, regional and project-section levels, outreach activities include, but are not limited to, webinars, open houses, regular community meetings, community and technical working groups, community and stakeholder outreach specific to each project section, internal and external newsletters tailored to specific issues areas, digital engagement across all of the Authority's multiple social media platforms including video, animations, graphics and fact sheets and regular one-on-one connections. The Regional Directors and local section outreach teams act as a point of contact for local and regional stakeholders to address community needs and concerns related to potential project effects in their areas. Regular stakeholder and/or public meetings facilitate communication and build relationships between the high-speed rail program and public participants and ensure that system designs, and plans address community issues and concerns.

## Organizational Development

Over the last two years, we have been addressing organizational issues that we and the California State Auditor found on the efficiency and efficacy of the policies and practices employed by the Authority. The State Auditor's report identified three broad areas for improvement: planning, contract management, and monitoring and reporting, and made 17 specific recommendations. The State Auditor affirmed concerns we were already in the process of addressing and recommended actions for improvement. Those recommendations augmented the work we have now completed.

In addition, the Peer Review Group has noted organizational capacity concerns related to oversight and management of upcoming operations contracts. When we started construction, we were slow to make the transition from strategic planning to project delivery. We were transparent about these challenges in the 2018 Business Plan and presented our strategies to create a mature organization; one with the necessary delivery capacity and capabilities. We, in consultation with the Early Train Operator (ETO), will continue to evolve the organization to ensure appropriate State management and oversight of these operational contracts and activities.

## STATE AUDIT UPDATE

In the two years since Audit Report 2018-108 was issued, the Authority has worked diligently to implement recommendations and provide evidence to the State Auditor. The recommendations focused on improving processes and updating areas of construction planning and oversight, contract management, contract manager oversight, and legislative, sustainability and small business utilization reporting.

As a result of our focused efforts, the State Auditor has concurred that 15 of the 17 recommendations are fully implemented. One recommendation remains partially implemented on how to present information in the ARRA Status Report in a manner that satisfies the recommendation. The other outstanding recommendation is the preparation of a contingency plan related to the federal grant deadline. Full implementation is pending awaiting the incoming new federal Administration and the re-engagement of the Federal Railroad Administration.

The Authority has continued to build upon specific recommendations from the State Auditor. At the direction of the CEO, the Authority has taken concrete steps to mature the organization. For instance, we have successfully received approval for budget change proposals in consecutive years under the Form-to-Function effort of realigning the Authority's resources. The latest approved proposal provides for 85 additional state positions to reduce reliance on contracted resources, resulting in an estimated \$18 million in cost savings. In addition, the CEO directed two organizational structural changes, one to implement Enterprise Risk Management and another to develop a Stage Gate process for improving governance and operational decision-making related to future projects.

**“There has been a high level of commitment from them and it’s encouraging as we go through this process.”**

— Mark Reinardy

State Auditor’s Office

Joint Hearing Senate Transportation Committee  
and Senate Budget Subcommittee, March 2019

## Program Delivery Risks

The progress that we have made on environmental clearances and efforts to finalize designs to increase the rate of construction in the Central Valley sets the stage to complete significant construction milestones in the next year. We are actively managing the risks related to the current construction on the 119 miles from Merced to Poplar Avenue. However, the upcoming construction related to developing an operational, electrified test track represents new areas of risk.

The Authority and the Federal Railroad Administration (FRA) jointly decided to begin construction in the Central Valley, the location that best met the objectives of building high-speed rail in California. At that time, the decision came with many positive benefits and known and unknown risks. Managing those risks has been harder in an organization that was evolving and maturing project delivery management and processes. It has taken a tremendous effort to put in place the processes, procedures, organizational structure and leadership team to manage that construction.

Our 2018 Business Plan identified a series of lessons learned and actions that we have taken. Since then, we have worked diligently and prudently to evolve into a program that has transformed every major aspect of the organization. We made many changes to the way that we do business and manage risks, including:

- Annual cost updates to a Board-approved Program Baseline, which authorizes projects and expenditures to be performed related to a specific integrated set of projects;
- Budget and resource allocation, which identifies and allocates resources necessary to complete project activities and actions for the completion of those projects;



- Governance and decision making, which has led to greater organizational focus, coordination and progressive decision making;
- Development of Key Performance Indicators (KPI), which provides a management tool to monitor individual project and contractor delivery progress; and
- Updated reporting, which is comprised of a series of internal and external reports on performance objectives and has brought greater transparency to the Authority's performance.

We have augmented our decision making and executing efforts around construction as well. This included adopting a development-to-delivery approach to project management. Key aspects of this work have included:

- A commitment to configuration management, taking the environmental Record of Decision (ROD)/Notice of Determination (NOD) that defines the general alignment, scope and environmental characteristics, allowing for further detailed project development;
- Evolution of project and change control, which involves a discipline and structure to further understand project status and to monitor contractor and consultant performance under State oversight; and
- Refined change management policies and procedures, which include an updated Change Management Plan and contingency allocation process, to provide the framework and process to successfully manage project change.

## **FUTURE DELIVERY RISKS**

We have noted in past business plans the ongoing challenges of building the first high-speed rail line in the United States. We continue to refine how we

address these challenges. Two areas where we will continue to focus our efforts include those related to engineering of tunnel construction and how we will move forward in future construction.

### **ENGINEERING**

We continue to apply our engineering discipline to address identified risks on current construction. This is part of the significant mitigation approach being used to address remaining Madera to Poplar Avenue construction challenges. This work has eliminated some risks and resulted in new approaches to identified challenges. These are all part of the funded project risks we currently face.

However, there are many unknowns associated with the engineering and environmental challenges with tunnels in mountainous terrains to close the gaps, which are currently unfunded. Staff are actively working with experts as part of the environmental process in these areas to identify opportunities and challenges and have conducted a preliminary hazard analysis on tunneling, ventilation and geotechnical risks. This will help to refine future costs and risks of this work to connect the Central Valley to Northern and Southern California. Staff will continue to explore these technical issues associated with construction as funds are available.

### **RIGHT-OF-WAY ACQUISITION AND THIRD-PARTY AGREEMENTS**

We have reported previously on the impacts moving to construction before clearly defining what right of way would be necessary and completing third-party agreements with utilities and communities. This has been an ongoing challenge. Although these activities are a consistent risk area for all major projects, our work over the last two years is making us smarter about how we prioritize the work in the future.

Some risks to construction remain:

- Coordination with many stakeholders and resolving a diversity of interests;
- Property size, location, use, impacts and the type of acquisition make each process unique; and
- Court processing time variability—an impact from the pandemic that was not expected.

Through a rigorous process of overseeing and managing these activities, construction in the Central Valley is progressing. Completion of Central Valley Segment designs for construction increased the number of parcels necessary for current construction. We have delivered approximately 75 percent of the parcels needed.

In September 2018, the Legislature approved Senate Bill (SB) 1172, allowed us to directly acquire right of way through purchase and eminent domain. This has streamlined our process of acquisition and further refinements have been made since then to accelerate the acquisition process. We have evaluated the ongoing risk of additional right of way and third-party agreements and increased the contingency to manage this remaining risk, as noted in Chapter 3.

Although it is uncertain if similar conditions driving construction will arise in the future, we have identified the necessary pre-construction activities prior to awarding future construction contracts. This includes having adequate design complete to define the alignment and identify right of way, third-party agreements and utility relocations necessary for construction. We have begun to outline a Stage Gate process to ensure we fully understand the implications of entering into construction contracts early. This may also result in consideration of alternative construction methods.

## ■ ENVIRONMENTAL DOCUMENTATION

The environmental process to identify preferred alternative alignments for Draft Environmental Impact Report/Environmental Impact Statement documents is complete. Some additional refinements continue based on the technical analysis included in draft environmental documents and their public review. Engineering designs at this stage are still at a preliminary phase of development and subject to completed environmental analysis.

Several corridors still have remaining stakeholder issues to be resolved. These areas include addressing concerns through the Angeles National Forest, addressing potentially conflicting local land use planning in certain Bay Area locations, shared corridor designs, addressing sensitive cultural, historical, environmental and ecological areas, other concerns important to local cities and neighborhoods, and specific alignment concerns, such as the crossing at the Hollywood Burbank Airport.

Additionally, we are working with a large number of cooperating and responsible federal, state and local agencies to address in the environmental documents their concerns about alignments, potential impacts and mitigation. These include agencies such as the Surface Transportation Board, the U.S. Forest Service, the U.S. Army Corps of Engineers and the U.S. Fish and Wildlife service, as well as the California Department of Fish and Wildlife, and the State Water Resources Control Board. These agencies have important roles and expertise in ensuring that specific resources are evaluated, considered and protected. Consistent with that role, these agencies provide comments that are, at times, extensive and require time to address.

Although we obtained National Environmental Policy Act (NEPA) Assignment, the FRA still needs to take certain actions necessary to complete the environmental process, including making General Conformity determinations under the Clean Air Act, conducting formal government-to-government consultations with federal tribes as needed, making any 4(f) constructive use determinations and making decisions with national policy implications. A failure by the FRA to take such actions in a timely manner may delay the Authority's ability to meet its environmental responsibilities.

In short, the environmental review process is the main opportunity for the public and government stakeholders to understand and comment upon our location and preliminary design and associated potential construction and operational impacts. We take very seriously our responsibility to collaborate with these stakeholders to find balanced solutions to concerns. Accordingly, the environmental schedules in this 2020 Business Plan predict completion dates well in advance of the federal ARRA deadline to provide a meaningful schedule buffer, if needed, to allow as much time as possible for potential resolution of stakeholder concerns.

## TRAINSET PROCUREMENT

The design and development of these vehicles will require additional interfaces with contractors designing and building the operations infrastructure. The design will require coordination with the Track and Systems contractor on connections to the communications network, as well as track and electrical interfaces. In addition, this contractor will also be responsible for the development of train maintenance facilities.

## Ridership/Revenue Risks

Ridership revenues need to be projected to be sufficient to cover the operations and maintenance costs of the program to comply with Proposition 1A requirements. It is envisioned that, at some point, the program's expansion will use system revenues to support access to private capital as the program matures. Inaccurate ridership forecasts could affect the level of private-sector investment, increasing the reliance on public funding and damaging stakeholder support.

We work with the Early Train Operator (ETO) to ensure that the travel demand modelling incorporates the latest developments in ridership estimating and assessing travel network forecasts. The ETO brings industry expertise to current ridership and revenue strategies to help us make future decisions on how to maximize ridership and revenue. Updates to the travel model have begun with the work the ETO has completed in the Central Valley and as part of the Side-by-Side Quantitative Study that it completed at the request of the Authority's Board of Directors. Further work will be conducted to continue to refine the overall program model.

In addition, we also subject the analysis to an independent peer review group. More information about the program model can be found in the Travel Demand Model Documentation Technical Supporting Document. To view this report, visit [https://hsr.ca.gov/docs/about/business\\_plans/2020\\_Business\\_Plan\\_CHSR\\_Ridership\\_and\\_Revenue\\_Model\\_BP\\_Model\\_Ver3\\_Model\\_Doc.pdf](https://hsr.ca.gov/docs/about/business_plans/2020_Business_Plan_CHSR_Ridership_and_Revenue_Model_BP_Model_Ver3_Model_Doc.pdf).

## Future Risks and New Technology

The Authority has now initiated a more in-depth discussion on future risks related to operation. New information now being developed relates to the design of track and systems for ultimate operations.

By way of example, we identified an issue that relates to connections to the power grid for high-speed rail electrification. The cost of these interconnections was previously included in traction power costs and assumed a nominal cost for each interconnection site. Technical feasibility studies by PG&E now indicate that there are capacity variations along the corridor that need to be upgraded for high-speed rail operations. Work is underway with PG&E to define the scope and costs of these improvements to the network, including new transmission line construction necessary for a reliable power supply within the PG&E service territory. Similar efforts will be necessary in Southern California, which is served by SoCal Edison and other providers. The Authority has instructed the ETO to expand on the risk identified above and begin an assessment of the additional risks moving forward.

Differences between actual costs and forecast costs could result in limiting resources available to continue system expansion. We will enhance our understanding of these areas through interactions with Network Rail (the operator and maintainer of both the high-speed and conventional rail network infrastructure in the United Kingdom), the ETO and the International Union of Railways to incorporate best practices.

Current assumptions and efforts are also documented in the Operations and Maintenance Cost Model Documentation Technical Supporting Document. To view this report, visit [https://hsr.ca.gov/docs/about/business\\_plans/2020\\_Business\\_Plan\\_Operations\\_and\\_Maintenance\\_Cost\\_Model.pdf](https://hsr.ca.gov/docs/about/business_plans/2020_Business_Plan_Operations_and_Maintenance_Cost_Model.pdf).





Rendering: Fresno station at completion



# FORECASTS AND ESTIMATES

This chapter provides the current forecasts and estimates related to the Silicon Valley to Central Valley and Phase 1 lines. These forecasts and estimates are developed pursuant to the Business Plan statutory requirements related to alternative financial scenarios. The areas covered in this chapter include:

- Ridership and revenue forecasts (high, medium and low);
- Operations and maintenance (O&M) cost estimates (high, medium and low);
- Life cycle cost estimates (high, medium and low); and
- Cash flow estimate (high, medium and low).

A final breakeven Monte Carlo analysis is conducted for three scenarios:

- Silicon Valley to Central Valley Line (opening year 2031);
- Phase 1 Line (opening year 2033); and
- Horizon Year of Phase 1 Operations (2040).

These forecasts and estimates are based on assumptions that a Silicon Valley to Central Valley Line will be operational by late 2031 and the Phase 1 System operational by 2033. These dates are only for the purpose of determining future year estimates in order to present statutorily requested operating and financial scenarios. The forecasts and estimates in this chapter use Year of Expenditure dollars (YOE\$) as calculated and presented in the Draft 2020 Business Plan and were not updated for this 2020 Business Plan.

YOE\$ are commonly used in capital cost estimates for public infrastructure projects whose

construction spans multiple years. YOE\$ illustrate the effect of projected inflation on costs over a projected project delivery schedule. To develop the YOE\$ estimates, we assume that the project is financially unconstrained; in other words, that the funds required to build it are available when they are needed. To prepare our YOE\$ estimate, we assumed that after the environmental Record of Decision (ROD) is issued, the project advances into final design and then into construction. They are based on an assessment of the amount of time it would take to build these lines, assuming funding is available when needed. The costs are loaded into a project delivery schedule built based on the projected time required to build the elements identified in each project section. Then escalation factors are applied to build the YOE\$ estimate.

It is important to note that a financially unconstrained schedule is used for illustrative purposes only, given that we do not have full funding to complete the project. However, absent any other basis for projecting when, and over what timeframe, additional funding may become available, this is the most reasonable option for calculating YOE\$ estimates. The project delivery schedule used as the basis for these estimates is illustrative and will depend on future decisions, funding availability and other factors.

All dates and numbers presented in this 2020 Business Plan are estimates available at the

## CHAPTER 7

time of the Draft 2020 Business Plan and are subject to change as the program progresses. Detailed methodologies and assumptions for all forecasts are included in the supporting technical documents to this 2020 Business Plan.

## Service Assumptions

Over the last two years, the Early Train Operator (ETO) and the Authority have worked with stakeholders and other rail passenger service providers to refine ridership, revenue and operating plan assumptions for the proposed Silicon Valley to Central Valley Line and subsequent extensions. This has included discussions on mobility, transit connectivity, shared facilities, new sources of revenue and other initiatives aimed at enhancing how the state's rail network connects and operates together.

Interim service between Merced and Bakersfield is expected to build the market and demand for high-speed rail service. It is anticipated this will generate higher beginning ridership results once the line connects to the larger Bay Area population and employment. This 2020 Business Plan also includes a revised service assumption for the Silicon Valley to Central Valley Line. The 2018 Business Plan assumed a single line from San Francisco's 4th and King Station to Bakersfield. In 2020, this line is now enhanced by the addition

of the Merced to Bakersfield Line. Both the augmented Silicon Valley to Central Valley Line (with Merced) and the Phase 1 services are forecast to continue to demonstrate significant net revenue performance.

For a complete summary of the service assumptions used for this 2020 Business Plan, please see the Service Planning Methodology Technical Supporting Document at [https://hsr.ca.gov/docs/about/business\\_plans/2020\\_Business\\_Plan\\_Service\\_Planning\\_Methodology.pdf](https://hsr.ca.gov/docs/about/business_plans/2020_Business_Plan_Service_Planning_Methodology.pdf).

## 2020 Business Plan Ridership and Revenue Forecasts

The ridership and farebox revenue forecasting model has been updated since 2018 to include the latest available input data related to socioeconomic forecasts; transit network plans; auto travel time; auto operating costs; parking costs; and updated high-speed rail service plans, reflecting updated trip times, station assumptions, service frequency and service patterns.

Initial model runs were based upon the 2018 Business Plan opening years of 2029 and 2033 for the Silicon Valley to Central Valley Line and 2033 and 2040 for Phase 1 System. The Silicon Valley to Central Valley ridership forecast was further refined based on a revised 2031 opening date.

Ridership and farebox revenue forecasts also incorporate a revised ramp-up methodology from the 2018 Business Plan. These revised ramp-up assumptions reflect the initial Merced to Bakersfield operations' impact on riders' perception and awareness of future Silicon Valley to Central Valley

and Phase 1 services. The assumption in previous Business Plans was that the Silicon Valley to Central Valley Line would be the first operation of high-speed rail service. Initial operation in the Central Valley will change this dynamic and is projected to lead to quicker ridership growth.

**“In the previous more detailed reviews of the modelling, we found the Authority’s ridership and revenue and O&M cost projection were produced using sound methodology which reflects industry best practice. Given the continuity of approach since 2016, this finding remains valid.”**

*– 2020 Project Finance Advisory Ltd., report*

The updated ramp-up factors are shown in **Table 7.0**.

**Table 7.0: Ramp-up Factors (in Percent)**

Ramp-up Application	Year 1	Year 2	Year 3	Year 4	Year 5
Ridership Silicon Valley to Central Valley Line	50	68	86	97	100
Revenue Silicon Valley to Central Valley Line	49	66	84	96	100
Ridership Phase 1 Increment	68	79	89	97	100
Revenue Phase 1 Increment	63	75	86	96	100

The changes to the service plan result in slightly increased ridership and revenue over the 2018 Business Plan results. This is primarily due to the increased service incorporating the Merced extension. However, the model's decreased population and employment forecasts has tempered these ridership increases to some extent.

For more detailed discussion of these impacts, see the Ridership and Revenue Forecasting Technical Supporting Document at [https://hsr.ca.gov/docs/about/business\\_plans/2020\\_Business\\_Plan\\_Ridership\\_and\\_Revenue\\_Forecasting.pdf](https://hsr.ca.gov/docs/about/business_plans/2020_Business_Plan_Ridership_and_Revenue_Forecasting.pdf).





Rendering: High-speed train

## RIDERSHIP AND REVENUE RISK ANALYSIS

The ridership and farebox revenue forecasts continue to use the enhanced risk analysis that addressed the feedback provided by Project Finance Advisory, Ltd. (PFAL), from its review of the 2016 Business Plan forecasts. The 2020 Business Plan risk analysis considers the same risk variables as the 2018 Business Plan but applied to the new ridership analysis for the 2020 Business Plan. The analysis uses the same assumed completion dates as cost estimate for purposes of evaluation.

This risk analysis builds upon the risk analysis conducted in 2018 and continues the use of the following risk variables based on the PFAL external review:

- Reliability of high-speed rail—capturing uncertainty around on-time reliability;
- Travel time in autonomous vehicles—measuring the disutility of time spent in an automobile and considers how travel choices might change with autonomous vehicles;
- Visitor travel—including out-of-state trips from tourism, business and other travel;
- Induced travel—including trips that would not have otherwise been made without the increased connections created by the high-speed rail system; and
- An enhanced penalty applied to long-distance high-speed rail trips that require long access/egress travel time.

For more detailed information on these results, see the Ridership and Revenue Risk Analysis Technical Supporting Document at [https://hsr.ca.gov/docs/about/business\\_plans/2020\\_Business\\_Plan\\_Ridership\\_and\\_Revenue\\_Risk\\_Analysis.pdf](https://hsr.ca.gov/docs/about/business_plans/2020_Business_Plan_Ridership_and_Revenue_Risk_Analysis.pdf)

## SILICON VALLEY TO CENTRAL VALLEY RESULTS

**Tables 7.1, 7.1.1** and **7.1.2** provide the ridership and revenue results for the Silicon Valley Central Valley line. These results reflect one month of

Silicon Valley to Central Valley operations in 2031 and one month of Phase 1 operation in 2033. In addition, the future year of expenditure (\$YOE) assumes an escalation of 3 percent per year from June 2019.

**Table 7.1:** Silicon Valley to Central Valley High, Medium and Low Ridership by Year (Riders in Millions)

Ridership Level	2031	2032	2033
High Ridership	1.0	12.1	17.9
Medium Ridership	0.7	8.6	12.8
Low Ridership	0.6	7.0	10.3

**Table 7.1.1:** Silicon Valley to Central Valley High, Medium and Low Farebox Revenue by Year (2019 \$ in Millions)

Revenue Level	2031	2032	2033
High Revenue	61	759	1,116
Medium Revenue	42	520	769
Low Revenue	35	437	648

**Table 7.1.2:** Silicon Valley to Central Valley High, Medium and Low Farebox Revenue by Year (YOE \$ in Millions)

Revenue Level	2031	2032	2033
High Revenue	87	1,115	1,688
Medium Revenue	59	763	1,163
Low Revenue	50	642	980

## PHASE 1 RESULTS

**Tables 7.2, 7.2.1 and 7.2.2** provide the ridership and revenue results for Phase 1. Ridership and revenue results assume one month of full Phase 1

operation in 2033. Future year of expenditure (YOE) estimates assume an escalation of 3 percent per year from June 2019.

**Table 7.2: Phase 1 High, Medium and Low Ridership by Year (Riders in Millions)**

Ridership Level	2033	2034	2035	2040	2045	2050	2055	2060
High Ridership	17.9	36.4	41.9	50.0	52.6	55.2	58.1	61.0
Medium Ridership	12.8	27.8	32.0	38.6	40.5	42.6	44.8	47.1
Low Ridership	10.3	21.3	24.5	29.3	30.8	32.3	34.0	35.7

**Table 7.2.1: Phase 1 High, Medium and Low Farebox Revenue by Year (2019 \$ in Millions)**

Revenue Level	2033	2034	2035	2040	2045	2050	2055	2060
High Revenue	1,116	2,319	2,723	3,381	3,466	3,554	3,644	3,736
Medium Revenue	769	1,644	1,932	2,410	2,471	2,533	2,597	2,663
Low Revenue	648	1,388	1,631	2,036	2,087	2,140	2,194	2,249

**Table 7.2.2: Phase 1 High, Medium and Low Farebox Revenue by Year (YOE \$ in Millions)**

Revenue Level	2033	2034	2035	2040	2045	2050	2055	2060
High Revenue	1,688	3,614	4,369	6,290	7,476	8,885	10,560	12,552
Medium Revenue	1,163	2,562	3,100	4,484	5,329	6,334	7,528	8,947
Low Revenue	980	2,163	2,618	3,787	4,501	5,350	6,359	7,558





Photo: Lazy K vernal pool restoration

## Greenhouse Gas (GHG) Analysis

The following tables describe the GHG benefits of implementing high-speed rail as part of a building block approach.

The information in **Tables 7.3, 7.3.1** and **7.3.2** summarizes the benefits achieved annually with each service implementation phase, beginning with Merced to Bakersfield in 2029, followed by

the introduction of service on the Silicon Valley to Central Valley line in 2031 and the full Phase 1 system by 2033.

These calculations are based on the results of the ridership modelling for the 2020 Business Plan. The calculations do not reflect any adjustments for the Safer Affordable Fuel-Efficient Vehicles Rule from March 2020.

**Table 7.3:** Merced to Bakersfield GHG Reductions by Year  
(in Millions of Metric Tons of Carbon Dioxide Equivalent)

Ridership Level	2029	2030
High Ridership	.075	.075
Medium Ridership	.075	.075

**Table 7.3.1:** Silicon Valley to Central Valley GHG Reductions by Year  
(in Millions of Metric Tons of Carbon Dioxide Equivalent)

Ridership Level	2031	2032
High Ridership	.10	.42
Medium Ridership	.093	.32

**Table 7.3.2:** Phase 1 GHG Reductions by Year (in Millions of Metric Tons of Carbon Dioxide Equivalent)

Ridership Level	2033	2034	2035	2040	2045	2050	2055	2060
High Ridership	.615	1.314	1.504	1.775	1.853	1.943	2.042	2.146
Medium Ridership	.480	1.073	1.229	1.459	1.524	1.598	1.680	1.765

## Operations and Maintenance Cost Estimates

Based upon the Early Train Operator's (ETO) review and experience, adjustments have been made to the 2020 Business Plan Operations and Maintenance (O&M) model assumptions to incorporate the latest available data. The key enhancements to the previous 2018 technical report include:

- Full operation of Silicon Valley to Central Valley and Phase 1 services, eliminating the operational ramp-up based on implementation of Merced to Bakersfield service;
- Maintenance and operations cost approach based on a maintenance response time with service levels assumed in the updated service plan;
- Cost assumptions for track access fees in the shared corridors;
- Updated revenue collection costs, including the costs to operate and maintain fare collection infrastructure; and
- New staffing approaches.

Consistent with the 2018 Business Plan approach, a Monte Carlo simulation was conducted to

understand the risks and uncertainties associated with the forecasts. These are then applied to derive a forecast O&M range of costs. The high- and low-cost forecasts presented reflect the results of these Monte Carlo simulations.

Overall, O&M costs have increased when compared to the 2018 Business Plan. First, the Silicon Valley to Central Valley Line assumes a new service plan that incorporates the Merced extension of the initial Merced to Bakersfield service. In addition, the ETO's review of previous assumptions and the application of their global experience has also updated some baseline costs.

For more information on these changes, see the Operations and Maintenance Cost Model Documentation Technical Supporting Document at:

[https://hsr.ca.gov/docs/about/business\\_plans/2020\\_Business\\_Plan\\_Operations\\_and\\_Maintenance\\_Cost\\_Model.pdf](https://hsr.ca.gov/docs/about/business_plans/2020_Business_Plan_Operations_and_Maintenance_Cost_Model.pdf).

## SILICON VALLEY TO CENTRAL VALLEY RESULTS

**Tables 7.4** and **7.4.1** summarize the results of the Silicon Valley to Central Valley analysis. Consistent with ridership and revenue, these results assume

one month of Silicon Valley to Central Valley operations in 2031 and one month of Phase 1 operations in 2033. Year of expenditure costs assume an escalation of 3 percent per year from June 2019.

**Table 7.4:** Silicon Valley to Central Valley High, Medium and Low O&M Costs by Year (2019 \$ in Millions)

O&M Levels	2031	2032	2033
High Operations and Maintenance Cost	38	457	557
Medium Operations and Maintenance Cost	35	418	509
Low Operations and Maintenance Cost	34	402	491

**Table 7.4.1:** Silicon Valley to Central Valley High, Medium and Low O&M Costs by Year (YOE \$ in Millions)

O&M Levels	2031	2032	2033
High Operations and Maintenance Cost	54	671	842
Medium Operations and Maintenance Cost	50	614	770
Low Operations and Maintenance Cost	48	591	742

## PHASE 1 RESULTS

**Tables 7.5** and **7.5.1** summarize the analysis for Phase 1 O&M costs. These results assume one month of Phase 1 operations in 2033.

Year of expenditure costs assume an escalation of 3 percent per year from June 2019.

**Table 7.5:** Phase 1 High, Medium and Low O&M Costs by Year (2019 \$ in Millions)

O&M Levels	2033	2034	2035	2040	2045	2050	2055	2060
High Operations and Maintenance Cost	557	1,085	1,139	1,197	1,200	1,216	1,215	1,228
Medium Operations and Maintenance Cost	509	992	1,041	1,094	1,097	1,111	1,111	1,122
Low Operations and Maintenance Cost	491	956	1,004	1,055	1,058	1,072	1,071	1,082

**Table 7.5.1:** Phase 1 High, Medium and Low O&M Costs by Year (YOE \$ in Millions)

O&M Levels	2033	2034	2035	2040	2045	2050	2055	2060
High Operations and Maintenance Cost	842	1,690	1,828	2,226	2,588	3,039	3,521	4,125
Medium Operations and Maintenance Cost	770	1,545	1,671	2,035	2,366	2,779	3,219	3,771
Low Operations and Maintenance Cost	742	1,489	1,611	1,962	2,282	2,679	3,104	3,636



## Life Cycle Cost Estimates

The life cycle costing methodology used in this business plan compiles all operations, maintenance, rehabilitation and replacement expenditures that the Authority will incur on initial capital investments through 2060 for the Silicon Valley to Central Valley and Phase 1 lines. The costs summarized in **Tables 7.6, 7.6.1** and **7.6.2** are specific to rehabilitating and replacing initial capital investments. Operations and Maintenance costs are reported separately above. This model methodology is similar to that used in past Business Plans, which provides a “cash flow” estimate of the funds required for rehabilitation and replacement. It is important to note that capital rehabilitation and replacement costs are based upon component parts of the system, with different longevity and costs. This creates some variability in the amount of budget necessary in

any given year to address these rehabilitation and replacement needs.

This 2020 Business Plan estimate includes a consolidated annual expenditures review and reports the capital investments needs in five-year increments starting in 2040 through 2060. These estimates have changed since the 2018 Business Plan to account for the Silicon Valley to Central Valley operations beginning at the end of 2031.

In addition, a Monte Carlo analysis was conducted to evaluate a potential range of life cycle cost forecasts as shown in the tables below. The Monte Carlo methodology employed in 2018 also applies to this 2020 Business Plan analysis. For more detailed information on this analysis, see the 50-Year Life Cycle Capital Cost Model Documentation Technical Supporting Document at [https://hsr.ca.gov/docs/about/business\\_plans/2020\\_Business\\_Plan\\_50-Year\\_Lifecycle\\_Capital\\_Cost\\_Model.pdf](https://hsr.ca.gov/docs/about/business_plans/2020_Business_Plan_50-Year_Lifecycle_Capital_Cost_Model.pdf).

**Table 7.6:** Silicon Valley to Central Valley High, Medium and Low Life Cycle Costs by Year (2019 \$ in Millions)

Level	2040	2045	2050	2055	2060
High Life Cycle Cost	0.10	43	118	130	631
Medium Life Cycle Cost	0.09	39	109	119	579
Low Life Cycle Cost	0.08	35	99	108	525

**Table 7.6.1:** Silicon Valley to Central Valley High, Medium and Low Life Cycle Costs by Year (YOY \$ in Millions)

Level	2040	2045	2050	2055	2060
High Life Cycle Cost	0.17	88	283	360	2,028
Medium Life Cycle Cost	0.16	81	260	331	1,862
Low Life Cycle Cost	0.14	73	236	300	1,689

**Table 7.6.2:** Silicon Valley to Central Valley High, Medium and Low Life Cycle Costs Cumulative Through 2060 (\$ in Millions)

Level	2019\$	YOY\$
High Life Cycle Cost	5,923	14,535
Medium Life Cycle Cost	5,438	13,345
Low Life Cycle Cost	4,933	12,105

\*Net Cash Flow from Operations

## Net Cash Flow From Operations Forecast

The estimates in **Tables 7.7, 7.7.1** and **7.7.2** illustrate the potential net cash flows that could be available from operations that could be applied to future development costs or future financing. Net operating cash flow after capital replacement is determined by calculating the net cash flow from operations (revenue less operations and maintenance (O&M) costs). Revenues include those generated from high-speed rail passenger service (farebox revenue), and feeder and connecting bus service, as well as ancillary revenues.

For this 2020 Business Plan, ancillary revenues were further evaluated to provide financial support for system expansion, capital funding and ongoing operations and maintenance. In prior business plans, we carried planning assumptions that

indicated that ancillary revenues could range from 1 to 4 percent of farebox revenues. Since the 2018 Business Plan, the ETO performed an analysis on benchmarking and market analysis of potential ancillary revenue sources from the system's real property and rights of way, as well as passenger-generated opportunities. This refined analysis provides a basis of support for ancillary revenues at an average of 2 percent of farebox revenues for the period through 2060. Ancillary revenue contributions could include sources such as advertising, parking, retail concessions, sponsorships and telecommunications. For more information on this analysis, see the High, Medium and Low Cash Flow Analysis Technical Supporting Document at [https://hsr.ca.gov/docs/about/business\\_plans/2020\\_Business\\_Plan\\_High\\_Medium\\_and\\_Low\\_Cash\\_Flow\\_Analysis.pdf](https://hsr.ca.gov/docs/about/business_plans/2020_Business_Plan_High_Medium_and_Low_Cash_Flow_Analysis.pdf).

**Table 7.7: Net Operating Cash Flow Silicon Valley to Central Valley Through Phase 1 High Case (YOE \$ in Millions)\***

Year	2031	2032	2033	2034	2035
Total Revenue	91	1,167	1,746	3,708	4,468
Less: O&M	(54)	(671)	(842)	(1,690)	(1,828)
Net Cash Flow from Operations	36	496	904	2,018	2,640

**Table 7.7.1: Net Operating Cash Flow Silicon Valley to Central Valley Through Phase 1 Medium Case (YOE \$ in Millions)\***

Year	2031	2032	2033	2034	2035
Total Revenue	62	797	1,200	2,623	3,164
Less: O&M	(50)	(614)	(770)	(1,545)	(1,671)
Net Cash Flow from Operations	12	183	430	1,079	1,493

**Table 7.7.2: Net Operating Cash Flow Silicon Valley to Central Valley Through Phase 1 Low Case (YOE \$ in Millions)\***

Year	2031	2032	2033	2034	2035
Total Revenue	51	657	996	2,194	2,650
Less: O&M	(48)	(591)	(742)	(1,489)	(1,611)
Net Cash Flow from Operations	3	66	254	705	1,039

\*Numbers may not add due to rounding.

## Breakeven Analysis

The Breakeven Analysis measures the likelihood that farebox revenue is equal to or greater than operations and maintenance costs in a given operating year. A Monte Carlo analysis is used to conduct this review.

The Monte Carlo process begins by identifying a range of potential operating and maintenance costs and revenue outcomes. These inputs are used as inputs into a probability model that selects at random one value from cost and one value from revenue and calculates the results. The model conducts this calculation, selecting randomly each time, thousands of times to develop a random distribution of results.

**Tables 7.8, 7.8.1 and 7.8.2 and Exhibits 7.0, 7.1 and 7.2** on the opposite page summarize the results of this Monte Carlo analysis for three points in time:

- Silicon Valley to Central Valley opening year (2031);
- Phase 1 opening year (2033); and
- Phase 1 horizon year (2040).

Each table summarizes how often the model predicted that a certain value would occur. Each exhibit shows the range of results over all runs.

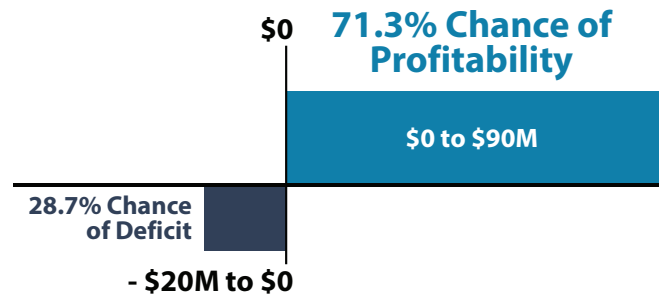
In 2018, this analysis showed a 79 percent probability that the Silicon Valley to Central Valley Line would cover its operations and maintenance costs on the year it opened (2029). That probability rose to 96 percent by the Phase 1 opening year of 2033, and greater than 99 percent by the 2040 horizon year. This analysis included only farebox revenues and would increase further if ancillary and other revenues were considered.

The 2020 Breakeven Analysis for Silicon Valley to Central Valley is a slight opening year decrease over the previous 2018 Business Plan, reducing from 79 percent to 71 percent. This is primarily caused by the increased operations and maintenance costs of the extension to Merced. The breakeven probability for the Phase 1 opening year is 83 percent and increases to greater than 99 percent by 2040.

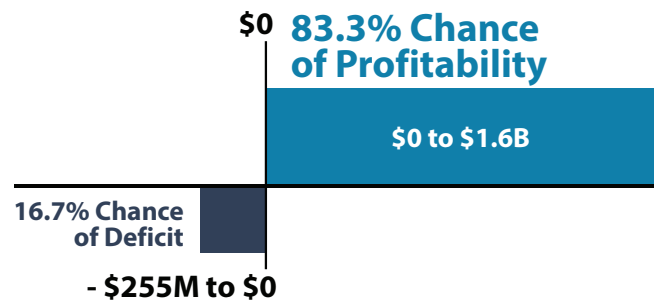
It is important to note that these assumptions are used for forecasting and estimating purposes only. These figures will continue to change as operating costs are further refined, as ridership estimates change and as the schedule for construction becomes more certain for these lines.

**Table 7.8:** Silicon Valley to Central Valley Opening Year 2031 (2019 \$ in Millions)

Probability Distribution	Net Operating Cash Flow
10%	(8)
25%	(2)
Median	9
75%	21
90%	34

**Exhibit 7.0:** Breakeven Analysis Silicon Valley to Central Valley Opening Year (2031)**Table 7.8.1:** Phase 1 Opening Year 2033 (2019 \$ in Millions)

Probability Distribution	Net Operating Cash Flow
10%	(58)
25%	59
Median	233
75%	453
90%	678

**Exhibit 7.1:** Breakeven Analysis Phase 1 Opening Year (2033)**Table 7.8.2:** Phase 1 Horizon Year 2040 (2019 \$ in Millions)

Probability Distribution	10%
10%	465
25%	861
Median	1,427
75%	2,108
90%	2,802

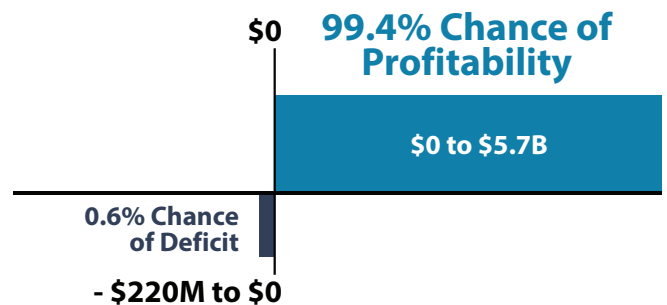
**Exhibit 7.2:** Breakeven Analysis Phase 1 Horizon Year (2040)





Photo: Major support structure for San Joaquin River Viaduct



# APPENDICES

## Appendix A. Statutory Requirements For A Business Plan

This 2020 Business Plan summarizes the progress we have made over the last two years, updates information and forecasts that were presented in our 2018 Business Plan and identifies key milestones and decisions we anticipate making over the next few years.

The Authority's governing statutes are established in the California Public Utilities Code sections 185000-185038; Section 185033, as amended by Assembly Bill (AB) 528 (Lowenthal, Chapter 237, Statutes of 2013), lays out the requirements for the Business Plan and they are as follows:

185033. (a) The authority shall prepare, publish, adopt, and submit to the Legislature, not later than May 1, 2014, and every two years thereafter, a business plan. At least 60 days prior to the publication of the plan, the authority shall publish a draft business plan for public review and comment. The draft plan shall also be submitted to the Senate Committee on Transportation and Housing, the Assembly Committee on Transportation, the Senate Committee on Budget and Fiscal Review, and the Assembly Committee on Budget.

(b) (1) The business plan shall include, but need not be limited to, all of the following elements:

(A) A description of the type of service the authority is developing and the proposed chronology for the construction of the statewide high-speed rail system, and the estimated capital costs for each segment or combination of segments.

(B) A forecast of the expected patronage, service levels, and operating and maintenance costs for the Phase 1 corridor as identified in paragraph (2) of subdivision (b) of Section 2704.04 of the Streets and Highways Code and by each segment or combination of segments for which a project level environmental analysis is being prepared for Phase 1. The forecast shall assume a high, medium, and low level of patronage and a realistic operating planning scenario for each level of service.

(C) Alternative financial scenarios for different levels of service, based on the patronage forecast in subparagraph (B), and the operating break-even points for each alternative. Each scenario shall assume the terms of subparagraph (J) of paragraph (2) of subdivision (c) of Section 2704.08 of the Streets and Highways Code.

(D) The expected schedule for completing environmental review, and initiating and completing construction for each segment or combination of segments of Phase 1.

(E) An estimate and description of the total anticipated federal, state, local, and other funds the authority intends to access to fund the construction

and operation of the system, and the level of confidence for obtaining each type of funding.

(F) Any written agreements with public or private entities to fund components of the high-speed rail system, including stations and terminals, and any impediments to the completion of the system.

(G) Alternative public-private development strategies for the implementation of Phase 1.

(H) A discussion of all reasonably foreseeable risks the project may encounter, including, but not limited to, risks associated with the project's finances, patronage, right-of-way acquisition, environmental clearances, construction, equipment, and technology, and other risks associated with the project's development. The plan shall describe the authority's strategies, processes, or other actions it intends to utilize to manage those risks.

(2) To the extent feasible, the business plan should draw upon information and material developed according to other requirements, including, but not limited to, the preappropriation review process and the preexpenditure review process in the Safe, Reliable High-Speed Passenger Train Bond Act for the 21st Century pursuant to Section 2704.08 of the

Streets and Highways Code. The authority shall hold at least one public hearing on the business plan and shall adopt the plan at a regularly scheduled meeting. When adopting the plan, the authority shall take into consideration comments from the public hearing and written comments that it receives in that regard, and any hearings that the Legislature may hold prior to adoption of the plan.

All of these requirements are addressed in this 2020 Business Plan. The Appendices include a listing of the plan sections and/or supporting technical memos that correspond to each of these requirements. These documents can be found at the following URL:

[https://hsr.ca.gov/about/business\\_plans/2020/](https://hsr.ca.gov/about/business_plans/2020/)



## Appendix B. Meeting Business Plan Statutory Requirements

Public Utilities Code Section 185033 Requirements	Response to Requirements and Location	Requirement Met
<p>The Authority shall prepare, publish, adopt, and submit to the Legislature, not later than May 1, 2014, and every two years thereafter, a business plan.</p> <p><i>Note: A Revised Draft 2020 Business Plan was submitted to the Legislature on February 9, 2021.</i></p>	<p>This is the 2020 Business Plan. It was adopted on March 25, 2021, and was submitted to the Legislature by April 15, 2021.</p>	Yes
<p>At least 60 days prior to the publication of the plan, the Authority shall publish a draft business plan for public review and comment.</p> <p><i>Note: A Revised Draft 2020 Business Plan was made available to the public for an additional 30-day review.</i></p>	<p>The Draft 2020 Business Plan was released on February 12, 2020.</p> <p>The Revised Draft 2020 Business Plan was released on February 9, 2021.</p>	Yes
<p>The draft plan shall also be submitted to the Senate Committee on Transportation and Housing, the Assembly Committee on Transportation, the Senate Committee on Budget and Fiscal Review, and the Assembly Committee on Budget.</p>	<p>The Draft 2020 Business Plan was submitted on February 12, 2020.</p> <p>The Revised Draft 2020 Business Plan was submitted on February 9, 2021.</p>	Yes
A description of the type of service the Authority is developing.	Chapter 4	Yes
The proposed chronology for the construction of the statewide high-speed rail system.	Chapter 4, Chapter 7	Yes
The estimated capital costs for each segment or combination of segments.	Chapter 5	Yes
A forecast of the expected patronage, service levels, and operating and maintenance costs for the Phase 1 corridor as identified in paragraph (2) of subdivision (b) of Section 2704.04 of the Streets and Highways Code and by each segment or combination of segments for which a project level environmental analysis is being prepared for Phase 1. The forecast shall assume a high, medium, and low level of patronage and a realistic operating planning scenario for each level of service.	Chapter 7	Yes
Alternative financial scenarios for different levels of service, based on the patronage forecast in subparagraph (above), and the operating breakeven points for each alternative. Each scenario shall assume the terms of subparagraph (J) of paragraph (2) of subdivision (c) of Section 2704.08 of the Streets and Highways Code.	Chapter 7	Yes
The expected schedule for completing environmental review, and initiating and completing construction for each segment or combination of segments of Phase 1.	Chapter 3, Chapter 4	Yes
An estimate and description of the total anticipated federal, state, local, and other funds the authority intends to access to fund the construction and operation of the system, and the level of confidence for obtaining each type of funding.	Chapter 5	Yes

Any written agreements with public or private entities to fund components of the high-speed rail system, including stations and terminals, and any impediments to the completion of the system.	Chapter 5, Chapter 6	Yes
Alternative public-private development strategies for the implementation of Phase 1.	Chapter 5	Yes
A discussion of all reasonably foreseeable risks the project may encounter, including, but not limited to, risks associated with the project's finances, patronage, right-of-way acquisition, environmental clearances, construction, equipment, and technology, and other risks associated with the project's development. The plan shall describe the authority's strategies, processes, or other actions it intends to utilize to manage those risks.	Chapter 6	Yes
To the extent feasible, the business plan should draw upon information and material developed according to other requirements, including, but not limited to, the pre-appropriation review process and the pre-expenditure review process in the Safe, Reliable High-Speed Passenger Train Bond Act for the 21st Century pursuant to Section 2704.08 of the Streets and Highways Code	Chapter 5	Yes
The Authority shall hold at least one public hearing on the business plan and shall adopt the plan at a regularly scheduled meeting.	Public comment was taken at the regularly scheduled Board of Directors meetings on February 18, 2020, and March 17, 2020. A public hearing was held on the Revised Draft 2020 Business Plan prior to the close of the public comment period (March 12, 2021). The 2020 Business Plan was adopted at the March 25, 2021, Board of Directors meeting.	Yes
When adopting the plan, the authority shall take into consideration comments from the public hearing and written comments that it receives in that regard, and any hearings that the Legislature may hold prior to adoption of the plan.	To be considered by the Authority in preparing final plan.	Yes

## Appendix C. Acronyms and Abbreviations

Acronym	Definition
ARRA	American Recovery and Reinvestment Act
ARTIC	Anaheim Regional Transportation Intermodal Center
BART	Bay Area Rapid Transit
BNSF	BNSF Railway
BPM-V3	Business Plan Model - Version 3
CalSTA	California State Transportation Agency
Caltrans	California Department of Transportation
CBA	Community Benefits Agreement
CEQA	California Environmental Quality Act
CP 1	Construction Package 1
CP 2-3	Construction Packages 2-3
CP 4	Construction Package 4
DBE	Disadvantaged Business Enterprise
DVBE	Disabled Veteran Business Enterprise
EIR	Environmental Impact Report
EIS	Environmental Impact Statement
ETO	Early Train Operator
FRA	Federal Railroad Administration
GGRF	Greenhouse Gas Reduction Fund (a.k.a. Cap-and-Trade proceeds)
GHG	Greenhouse Gas
LAO	Legislative Analyst's Office
Link US	Link Union Station Project
LOSSAN Corridor	Los Angeles–San Diego–San Luis Obispo Rail Corridor
Metro	Los Angeles County Metropolitan Transportation Authority
MOU	Memorandum of Understanding
NEPA	National Environmental Policy Act
PFAL	Project Finance Advisory, Ltd.
PRG	Peer Review Group
PTC	Positive Train Control
SCC	Standard Cost Category
TIRCP	Transit and Intercity Rail Capital Program
UIC	International Union of Railways
UPRR	Union Pacific Railroad
VMT	Vehicle Miles Traveled
YOE	Year of Expenditure

## Appendix D. Endnotes

1. Valley Children's Hospital, Hospital Council of Northern and Central California; "Community Health Needs Assessment Report 2016; Fresno, Kings, Madera and Tulare Counties"
2. European Commission, Directorate General of Transport, "Interaction between High Speed and Air passenger Transport," April 1996.
3. <https://www.apta.com/wp-content/uploads/APTA-Continuing-Impacts-COVID-19-Agencies-05-2020.pdf>
4. <https://www.apta.com/wp-content/uploads/APTA-COVID-19-Funding-Impact-2020-05-05.pdf>
5. This capital program estimate is no longer current. It has been updated in this 2020 Business Plan.
6. These cost and funding estimates were established in 2019; they have been revised as a result of the risk assessment conducted in response to COVID-19. Current estimates are included in this 2020 Business Plan.
7. Because the two initial trainsets will be the first prototypes, the costs per trainset will be higher than costs for future trainsets.



## Appendix E. Peer Review Group Letter

### CALIFORNIA HIGH-SPEED RAIL PEER REVIEW GROUP

- Kome Ajisi
- Fredrick Jordan
- Stacey Mortensen
- Bijan Sartipi
- Beverly Scott
- Lou Thompson Chairman
- Martin Wachs

April 10, 2020

The Honorable Toni G. Atkins Senate President Pro Tern State Capitol Building Room 205 Sacramento, CA 95814

The Honorable Anthony Rendon Speaker of the Assembly State Capitol Building Room 219 Sacramento, CA 95814

The Honorable Shannon Grove Senate Republican Leader State Capitol Building Room 305 Sacramento, CA 95814

The Honorable Marie Waldron Assembly Republican Leader State Capitol Building Room 3104 Sacramento, CA 95814

Dear Honorable Members:

The Peer Review Group (PRG) is required by law to report to the Legislature on its assessment of the Business Plans issued by the California High-Speed Rail Authority. This letter fulfills that requirement with respect to the “2020 Business Plan: Delivering the Vision” issued by the Authority on February 12, 2020 (the Business Plan). In addition, the Authority issued reports produced by KPMG entitled “California High-Speed Rail Merced to Bakersfield Business Case Study,” dated February 2020 (the KPMG Business Case Study), and by the Early Train Operator (ETO) entitled “Side-by-Side Study, Quantitative Report, February 8, 2020” (the Side-by-Side Study). The comments below reflect the contents of those reports as well. The Legislature also has available a report by the Legislative Analyst’s Office (LAO), “Review of the Draft 2020 High-Speed Rail Business Plan.” This report deserves careful review.

The Peer Review Group received the draft 2020 Business Plan and began its review prior to the extremely disruptive public health emergency caused by the Covid-19 virus. We submit this report in compliance with legislative requirements though the enormity of the social and economic disruption may result in huge uncertainty regarding the future of the high speed rail program regarding its schedule, costs, and priorities in ways that we cannot yet assess. Cap and trade revenues, construction schedules, resolutions of pending litigation, federal stimulus packages, and state priorities over the coming months are all yet to be addressed and will almost certainly require that the 2020 Business Plan be reassessed. Our substantive comments document our views prior to the cmTent emergency. The Peer Review Group recognizes the importance of responding appropriately as required by events yet to occur. We offer to be of service to the extent that our participation can assist in addressing any changes in the planning due to emergency conditions.

In this letter we focus on the major points for legislative consideration. We will send more detailed comments separately to the Authority on the three studies.

The 2020 Business Plan reviews the history of the project to date and recommends completion of a fully electrified, high-speed link from Merced to Bakersfield operating at 180 miles per hour. This entails completion of the 119-mile Madera to Poplar Avenue segment already underway along with an added 19-mile segment from Poplar Avenue into Bakersfield and a 33-mile segment from Merced to Madera. The entire 171-mile length would be electrified, and highspeed electric trainsets would be acquired to serve the section. Existing Altamont Corridor Express (ACE) and San Joaquin services would be connected to the high-speed link with coordinated schedules at a proposed cross-platform transfer station in Merced. The Business Plan states that the Authority's portion can be funded within the current budget and projected financing sources. Based on conclusions in the Side-by-Side Study, the Business Plan argues that the total operating subsidy paid by the state and local authorities to operate the combined services could be reduced below the level they would face otherwise because of increased demand generated by the improved speeds from Merced to Bakersfield.

Capital costs in the Business Plan are largely based on information provided in the 2019 Project Update Report and include only limited new information relating to the proposed added links. In particular, cost estimates for the parts of the system in Phase I but outside the Merced to Bakersfield section have been adjusted for cost inflation but have otherwise not been updated to the same standards as the parts within the section. Full project costs are not scheduled to be comprehensively updated until the 2021 Project Update Report.

The KPMG Business Case Study reviews the proposal emerging from the Side-by-Side Study and highlights the issues that will need to be addressed if the Business Plan proposal is adopted. The PRG finds the KPMG Business Case Study to be a well prepared and extremely informative document that deserves careful review.

The three studies make it clear that the Legislature faces critical decisions on the future of the project. Currently planned actions by the Authority - award of the Trainset contract and award of an integrated Track and Systems agreement, both scheduled for Board approval in late 2020 will set the course of the project for the foreseeable future. When these contracts are awarded, completion of the 171-mile Madera to Bakersfield section, and at least the next five years of the project, will be committed.

As we have discussed in previous letters and testimony, the Legislature has alternatives to the Authority's proposal. One proposed alternative that has been raised would be to limit spending in the Central Valley to the work needed to retain the \$2.6 billion in American Recovery and Reinvestment Act of 2009 (ARRA) money. This would essentially include completion without electrification of the 119-mile section of tracks between Madera and Poplar Avenue by the end of 2022, while shifting the funds made available by the reduction in construction costs to the commuter systems in southern and northern California. This issue is discussed in more detail in the LAO report cited above. We do not discuss it further in this letter because there is no specific plan put forward.

## THE AUTHORITY'S PLAN

As the Authority recommends, completion of the proposed 171 mile fully electrified system from Merced to Bakersfield would demonstrate a modern electrified high-speed rail system and would give the first experience with actual ridership and revenue (as opposed to demand and operating cost forecasts based on models) for high-speed rail in the state. The service would bring immediate benefits to the Central Valley and significantly improve the rail connections from Sacramento and the East Bay area to Bakersfield. It would keep the high-speed rail concept

alive and preserve future options for extensions to San Francisco and Los Angeles/ Anaheim if new sources of financing become available. It would provide productive use of the trainsets and track before service to Silicon Valley can begin and would facilitate full testing of the new trainsets and track systems. Finally, the experience gained in construction planning and management would build the knowledge base of the Authority and its consultants and could add credibility to future cost and schedule plans so

that a future proposal to extend lines north or south could be based on demonstrated project management competence by the Authority.

## ISSUES IN THE AUTHORITY'S PLAN

Although the Authority's plan is based on analysis by the ETO and KPMG, the demand and operating cost forecasts for the interim service are necessarily not based on the same quality of analysis as the forecasts for the full system presented in prior Business Plans. They are also based on a number of assumptions including the assumption that reliability of the connecting services will be far better than the current 75 percent on-time performance of the San Joaquin services. As a result, the plans still have a significant range of uncertainty.

The plan critically requires that the high-speed line be "leased" to another operator, potentially either a state or local agency such as Cal ST A or the San Joaquin Joint Powers Authority. Proposition 1 A prohibits the Authority from subsidizing operations, so the terms of the lease may need to require that the lessee pay full compensation for all of the Authority's costs of operating and maintaining the line and trainsets. The terms for this lease have not been defined and there is no clear expression of commitment from, or negotiation of terms with, any of the potential lessors. Moreover, since design and operating decisions are being made by the Authority in advance of full concurrence and commitment of the lessee/operator(s), it is possible that the costs and revenues of the interim system will be different than expected. Estimates of costs are preliminary and could turn out to be higher than lessors are able or willing to pay. For

these reasons, it may be difficult to implement an interim arrangement that does not violate the terms of Proposition 1A. The approach could also lead to litigation -and project delay -over whether it is legal under the no-subsidy strictures of Proposition 1A.

Success of the proposed interim operation is also dependent on action by the state and local authorities to plan and fund construction of connecting lines and a station in Merced that will integrate ACE and the San Joaquin services seamlessly with the connecting high-speed service. The required plans and commitments to construct and operate do not yet exist and the existing services do not operate at the high level of reliability assumed in the plan for interim service. Unless the connecting service is as reliable as envisioned, the demand could fall below estimates and the potential support could consequently be higher. Because the reliability of connecting services is a significant factor, the Authority should more explicitly indicate the impact on demand and subsidy of different levels of on-time performance by the connecting carriers.

Completion of the added links from Merced to Madera and from Poplar Avenue to Bakersfield and acquisition of the high-speed trainsets may strain the Authority's managerial and financial capability to meet the basic ARRA agreement requirements. Completing the ARRA requirements within the 2022 deadline is already subject to question as it requires a dramatic increase in the construction spending now underway. According to the Authority's dashboard report of November 30, 2019, average spending to meet the ARRA schedule will have to average \$184.6 million/month as compared with \$112.3 million/month in the latest quarter and the previous 12-month average of \$76.1 million/month. Although the spending rate has increased in recent quarters, it is still only 60 percent of the required level, and each month of shortfall makes eventual completion on schedule even more challenging.

Capital cost estimates for the added links to Merced and Bakersfield are not as well developed as those for the existing 119-mile segment, nor have there yet been any bids for the trainsets or the required electrification, signaling and trackwork covered by the Track and Systems contract. Further cost increases could threaten completion of the planned work within existing resources. To date, the Authority is projecting a 70 percent increase over the award value of the five construction packages underway so far. These costs are considered to have a "P70" level of confidence, which means that the Authority believes there is a 70 percent probability that the completed costs will fall within the estimate to complete. With the exception of the SR 99 relocation, which

is now finished, completion dates are two to three years beyond the date expected when the contracts were awarded. Given this history, the possibility of schedule stretches and increases over budgets for completion of the 171-mile segment is significant.

The Authority believes it has learned lessons from its experience with the initial contracts and intends to apply these lessons to future contracts. There remains a valid question as to how much the experience to date will, or can, reduce uncertainty in future contracts, especially for elements such as electrification, signaling, and trainsets where the Authority has no past experience. Longer term challenges and uncertainties, such as the extremely costly tunneling needed to connect to San Francisco and to the Los Angeles Basin, also remain if extension beyond the Central Valley is to be accomplished.

A potential budget limit would be even more severe if the Authority fails to recover the \$929 million in FY 2010 money that the Federal Railroad Administration has already de-obligated. This issue is in litigation and the outcome is not clear, though it is now likely that the litigation

will be extended into 2021. If there is significant delay in the award and initiation of the proposed Track and Systems agreement, meeting the ARRA deadline could be endangered and, if the ARRA money is lost or reduced, completion of the proposed 171-mile segment within available resources would be further weakened. The actual funding at risk in a possible federal

claw-back of the ARRA money is also not clear though it may not be as large as it appears because a federal claim could be limited to the percentage of the system that has not been completed by the end of 2022 rather than an all-or-nothing risk of the federal money. This would also presumably be determined by litigation if the federal position is actively pursued.

The planned Track and Systems agreement would integrate the designs of track, signals and overhead catenary with the trainsets, and potentially also bring greater predictability to maintenance costs of the infrastructure system. The complexity of the agreement may also raise a risk of delay if there are protests, or if the contract terms or costs need to be negotiated before award. The Track and Systems agreement also envisions a 30-year (or longer) maintenance commitment during which changes in scope and schedule and unpredictable operational, economic and technical factors must be accommodated. This has proven difficult in many longterm contracts elsewhere and may challenge the Authority since it depends on many decisions yet to be made

Awarding the Track and Systems agreement contract and especially the Trainset contract will effectively commit the state to completing the 171-mile segment regardless of what the eventual cost may be. This could require finding new sources of finance should current budgets be overrun. In any case, The Authority has acknowledged that there may be a temporary funds flow timing issue even if current budgets are proven correct.

## **DECIDING**

The Legislature should consider whether completion of the Merced to Bakersfield system would increase the probability of eventually completing the links to San Francisco and Los

Angeles/ Anaheim, given that added sources of financing will clearly be required if the system is to be extended beyond the Central Valley. If there is a low likelihood that the full system will be completed eventually, the case for the Authority's plan would be weaker and the argument for considering other options would be strengthened. If the Legislature concludes that the project probably will eventually be extended to the north and south, even though additional sources of financing will be required, then the case for the Authority's plan would be stronger.

The only time-limited requirement is completion of the ARRA obligations in order to ensure that the federal funding is not lost. Other than this, the Legislature could take the time it needs before making irrevocable commitments. In particular, the Legislature



could request that the Authority pause before awarding the Trainset contract, and possibly the Track and Systems contract, until the state and local agency partners present appropriately developed plans and commitments with respect to the proposed lease of the high-speed infrastructure and the trainsets along with the planning and funding of the required station and cross-platform connection at Merced. The commitment should include estimates of the amounts and shares of capital and operating funding that would be required based on a reasonable range, agreed by all parties, of estimates of the demand and revenue generated by the interim system and it should clearly indicate how service schedules will be integrated and enforced.

The KPMG Business Case study contains on pages 18 and 19 findings that are especially relevant and that should be quoted in full [emphasis added]:

- The Authority and the Board should secure a sufficient level of commitment from the SJJP A/SJRRC, Cal STA and/or other regional partners in the form of a memorandum of understanding before making any major long-term commitments and operating decisions with regards to Interim Service. Elements of the agreement should at least include:
  - Commitments to invest and develop the regional rail connectivity infrastructure up to and around Merced station
  - Agreement on the operational and performance requirements and associated payment terms of the Track and Systems and Trainset contracts including commitment to utilize and pay for assets as they become available on a segment by segment basis for Interim Service
- Prior to signature of the Track and Systems and Trainset contracts, the Authority should:
  - Ensure stakeholders, including SJJPA/SJRRC, Cal STA, and/or other regional partners are formally committed to Interim Service prior to the execution of additional major contracts ...
  - Include flexibility in the first NTP to allow the Authority to comply with the minimum scope of the federal grant requirements (i.e. plain-line track and deadline) by setting specific delivery milestones and other control points to mitigate the Authority's financial exposure
  - Ensure the design-build civil works contracts are fully aligned with the Track and Systems contract, including any necessary renegotiation and amendment of existing design-build contracts to allow for the delivery and acceptance of 5-mile sections of the civil works and the associated delivery schedule ...
  - Complete the acquisition of all ROW for the 119-mile test track.

We recommend that the Authority follow KPMG's advice.

Our previous letters have affirmed the role for high-speed rail within a properly developed plan for rail passenger service in California. This should be based partly on the time saving, convenience and cost of rail service, and partly on realistic values for the public benefits that rail can generate by lowering air and highway congestion and noise impacts, pollution reduction, reduction in carbon emissions, improved safety, increased access to employment and focusing of travel and development into areas where environmental impact can be controlled. This would have to be based on the willingness of the private sector operator and state and local governments to share appropriately in investment, operating income, and risk. It would also require stable and adequate financing to construct and operate the system.

Much remains to be done to get to this point. In considering the future of the high-speed rail project, the Legislature should review the status of the passenger rail sections of the State Rail

Plan to ensure that the Authority, the state and involved local officials share a common understanding of what will be required of each. This is particularly important because the Authority's interim operating plan is conditioned on active roles for the state and local authorities that operate ACE and the San Joaquin services and because longer-term plans for Phase I are dependent on cooperative, blended operations with Caltrain and Metrolink.

Also critical is the continuing, and damaging, impact of inadequate, unstable funding. From the project's beginning, the Authority has struggled to match optimistic initial visions and promises with escalating cost estimates constrained within a financing plan in which the state alone would pay only one-third of the total investment cost. The other two-thirds were supposed to come from federal and private sources that have not materialized. Ensuing analysis has confirmed that private investment can be mobilized only after the system has been completed and actual demand and operating cost have been demonstrated: this means that construction of the system must be financed from public sources before significant private investment will be feasible.

We are unable to assess the impact of the Covid-19 crisis on finances from all sources, but it is likely to be significant. State resources will clearly be challenged. Federal resources may increase to combat the economic impact of the crisis as happened in 2008, but such assistance would likely be conditioned on a very rapid increase in cash outlays, something that the Authority would be challenged to do effectively.

The initial goal of a completed system from San Francisco to Los Angeles and Anaheim has had to contract by painful stages, first to a proposal to connect the Central Valley to the Los Angeles Basin (with a delayed connection to San Francisco), then to a proposal to connect the Central Valley to San Francisco (with a delayed connection to Los Angeles), and now to the current proposal to connect Merced to Bakersfield with no clear capability or commitment to extend either north or south. Given the uncertainties in cost estimates for electrification and trackwork and the threat to the federal financing, the Authority may have difficulty completing even this segment without further support from the state.

Some of the project's problems have been due to the kind of "optimism bias" that always affects public mega-projects. As a result, as the project has proceeded, much of the progress to date has been painful and hard-won: much more remains to be learned, especially about the construction and operating costs of the trainsets, electrification, signaling, and tunneling. Actual experience that will clearly demonstrate travel demand and operating costs and validate the demand forecasts and operating economics is also far in the future. Although the Authority believes it has learned from its experience, it has yet to demonstrate that it can actually manage and complete its complex planning and construction commitments within schedule and budget.

If the project is to proceed, the Legislature should assess the impact that inadequate and unpredictable financing has had and will continue to have on the project. It is not possible to manage a project of this size effectively when project scope is continually changing. Contracts cannot be properly scaled due to unpredictable funding and contractors charge a risk premium as a result. It is hard to hire and retain competent and motivated staff when the future is not secure.

Commitment of a share of the carbon trading income was a valuable improvement to available funding, but carbon trading revenues are not fully predictable, and the Authority cannot issue bonds against this income stream except with an unusually high-risk premium.

If the Legislature decides to support the Authority's 2020 Business Plan proposal, it should also consider now how the next extension either to the north or south will have to be financed. In past testimony and letters, we have discussed a range of funding options, from guaranteeing the Authority's share of carbon trading revenues to consideration of potential tax or user charge revenue streams. Some combination of these could put the project on a firmer basis. Until this issue is addressed, the future


project scope and schedule cannot be stabilized. The financing issue can be postponed, at an increasing cost, but it cannot be avoided indefinitely.

Please let me know if you have any questions about the issues raised in this letter. As stated above, we remain ready to provide further comment as the outcome of the Covid-19 crisis evolves.

Sincerely ,

Louis S. Thompson Chairman, California High-Speed Rail Peer Review Group

cc:

A handwritten signature in black ink, appearing to read "Louis S. Thompson", followed by a long horizontal flourish.

- Hon. Jim Beall, Chair, Senate Committee on Transportation
- Hon. Patricia C. Bates, Vice Chair, Senate Committee on Transportation
- Hon. Jim Frazier, Chair, Assembly Transportation Committee
- Hon. Vince Fong, Vice Chair, Assembly Transportation Committee
- David S. Kim, Secretary, California State Transportation Agency
- Gabriel Petek, State Legislative Analyst
- Kate Gordon, Director, Governor's Office of Planning and Research
- Lenny Mendonca, Chair, California High-Speed Rail Authority
- Brian Kelly, Chief Executive Officer, California High-Speed Rail Authority
- Members, California High-Speed Rail Peer Review Group

## Appendix F. Peer Review Group Letter

### CALIFORNIA HIGH-SPEED RAIL PEER REVIEW GROUP

- Kome Ajisi
- Fredrick Jordan
- Stacey Mortensen
- Bijan Sartipi
- Beverly Scott
- Lou Thompson Chairman
- Martin Wachs

July 17, 2020

Dear Brian,

The Authority announced on June 22nd that the Final 2020 Business Plan will be submitted December 15, 2020 rather than June 15, 2020. The stated reason for the delay is to provide a more robust analysis including the potential impact of the Covid-19 crisis and to provide a more detailed and complete risk analysis.

In addition, in its resolution of June 21, 2020, the Legislature required the Peer Review Group to comment on the Business Plan to be submitted on the 15th of December. The relevant language is:

SEC. 9. (a) (1) Notwithstanding any other law, the business plan required to be prepared, published, adopted, and submitted to the Legislature no later than May 1, 2020, pursuant to subdivision (a) of Section 185033 of the Public Utilities Code shall be prepared, published, adopted, and submitted no later than December 15, 2020. (2) After the High-Speed Rail Authority publishes the draft of the business plan described in paragraph ( 1 ), the authority shall submit any update to the draft business plan to the independent peer review group established pursuant to Section 185035 of the Public Utilities Code for review before the authority adopts the business plan.

The purpose of this letter is to clarify the timing of our review and to outline several issues that should be covered in the draft Final Plan submitted to us for review.

**Timing.** We believe the timing requirement would best be met in two steps: a (probably Zoom) meeting with the Group and your team in early October to discuss your expected approach in the draft Final Plan; and, an opportunity to review and comment on the draft Business Plan you intend to submit to the Board at least two weeks before the Board is asked to act on it.



## ISSUES FOR INCLUSION IN THE PLAN

**Definition of the requirements of the ARRA agreement.** The Plan should provide a discussion, including opinion of HSRA counsel, on the work the Authority must complete to comply with the requirements of the ARRA grant. The Plan should also include an updated schedule for the completion of the required work based on projected progress through the end of 2020 and should identify measures the Authority is taking to ensure meeting the substantial progress requirements of the ARRA deadlines. This requires attention because the Authority's latest dashboard shows that the spending rate on CP I -CP4 must double in order to complete the ARRA work within the stated deadline.

**Updated Capital Costs and Schedule.** The Plan should update all capital costs and construction schedules for Phase I of the project based on lessons learned from experience on the first four construction packages.

**Definition of Options for Added Funding.** Capital cost estimates have only been partly updated since 2018 and funding sources have become less certain, both because of the threats to \$3.6 billion in federal funding and instability in Cap and Trade receipts as shown in the most recent auction. Moreover, the Authority has yet to develop experience with the costliest project components such as tunneling, electrification, signaling and rolling stock nor does the Authority have experience working in the areas north of Madera or south of Bakersfield. When the uncertainty in these elements is included, completion of the Authority's proposal for the Merced to Bakersfield section may well require funding beyond the sources now identified. There is no question that construction beyond the Merced to Bakersfield section will require added funding from new sources. The Final Plan must acknowledge the need for options for added funding of a program that will cost more and take longer than expected.

**Opinion of HSRA counsel on the legality of leasing the Merced to Bakersfield line and equipment to others as a method of shifting operating subsidy to the lessees.** Would a contract with another agency to operate passenger train service using public funds constitute a subsidy and violate the terms of the proposition? What legal arrangements are needed to lease the line and rolling stock to a local agency (probably the San Joaquin Joint Powers Authority) and the state?

**Agreement or memorandum of understanding with the potential lessees at an appropriate level of detail on the operating plan and support responsibility** for the leased line along with re-analysis of any impacts on demand and operating forecasts resulting from the full operating plans and schedules. The agreements should establish which agencies would bear the responsibility for covering all of HSRA's costs and holding it harmless in the event that capital costs or subsidies are larger than projected by the Early Train Operator.

**Description at an appropriate level of detail of the facilities needed to put the interim operation plan into operation along with commitments from all partners on their investment and construction management roles.** This should include, for example, the expected station layout needed to achieve the integrated services proposed by the Early Train Operator. Any investment and schedule risks to HSRA from behavior by the partners should be clearly identified.

**The Overall Role of Rail Passenger Service in California.** In reviewing the Final 2020 Business Plan, the Legislature needs an explanation of how high-speed rail passenger service fits into the future state passenger transportation network. Cal ST A should provide the Governor's vision for rail passenger service, addressing the likely funding needs of the high speed rail project, plans

for other passenger service in the state, expected development of highway and passenger transport, expected economic and demographic development patterns in the state as they bear on high-speed rail, and realistic options for funding the state's plans.

Please let me know when you can suggest the date in early October for discussion with the Group. Thanks for working with us on this.

Sincerely,



Louis S. Thompson

Chairman, California High-Speed Rail Peer Review Group

cc: Members, California High-Speed Rail Peer Review Group

# Appendix G. Peer Review Group Letter

## CALIFORNIA HIGH-SPEED RAIL PEER REVIEW GROUP

- Kome Ajisi
- Fredrick Jordan
- Stacey Mortensen
- Bijan Sartipi
- Beverly Scott
- Lou Thompson Chairman
- Martin Wachs

The Honorable Toni G. Atkins	The Honorable	The Honorable Scott Wilk	The Honorable Marie Waldron
Senate President Pro Tem	Anthony Rendon	Senate Republican Leader	Assembly Republican Leader
State Capitol Building	Speaker of the Assembly	State Capitol Building	State Capitol Building
Room 205	State Capitol Building	Room 305	Room 3104
Sacramento, CA 95814	Room 219	Sacramento, CA 95814	Sacramento, CA 95814
	Sacramento, CA 95814		

March 12, 2021

Dear Honorable Members:

The High-Speed Rail Authority's "Revised Draft 2020 Business Plan," issued February 12, 2021, is a good summary of the status of the project. After a troubled beginning, the Authority is progressing in getting the construction work under control. The Authority can reasonably expect to complete the 119-mile Madera to Poplar A venue segment with existing funding.

Adding segments from Merced to Madera and from Poplar A venue into Bakersfield ( extending to 177 miles in total) within existing funding, as the Authority is considering, will be a challenge both because of the need to finalize complex operating agreements and because designs for the segments are still at an early stage. The Authority will not be able to extend construction beyond the 177-mile section without funding sources beyond Proposition IA, ARRA and Cap-and-Trade.

The Peer Review Group (PRG) urges the Legislature to consider the following challenges and opportunities raised by the Plan:

- What is the balance between the need to move forward on the project and ensuring that the management of the project is improving sufficiently to justify doing so;
- What are the potential sources of new funding and when might they become available;
- Can the project be more effectively included in the statewide transportation planning program so the full role and benefit of high-speed rail, including its multiplier effects, can be seen in the proper state-wide context; and
- Can the intentions expressed in the MOU among HSRA, SJJPA and CalSTA be translated into detailed and binding commitments that will ensure the success of the proposed interim operation?

The pace of construction is accelerating, and the Authority is learning from the problems encountered on the early construction contracts (CPI, CP2-3 and CP-4). Many of the Authority's early staffing problems, especially the shortage of internal staffing and over reliance on consultant staffing, are being resolved. The engineering and Right-of-Way (ROW) acquisition issues of proposed added links to Merced and Bakersfield are likely to be similar to those already encountered, so the Authority will benefit from its hard-won experience. Most of the 119-mile section from Madera to Poplar Avenue defined in the "American Recovery and Reinvestment Act of 2009" (ARRA) contract with the Federal Railroad Administration (FRA), also called the Central Valley Section or CVS, is under contract and well under construction. Completion of the committed ARRA scope is expected in 2023.

At the same time, other new challenges will soon arise. Electrification, signaling, and the design and acquisition of rolling stock lie ahead. The immense tunneling effort required to connect to San Francisco and to the Los Angeles basin will also pose problems.

ROW acquisition and third-party agreements are moving ahead, but have been a major cause of cost increases and delays to date, and problems remain to complete them. Acquisition of eminent domain authority has been helpful but legal process delays due to Covid-19 have been significant. The PRG believes that the Authority will be able to complete the ARRA scope within currently available funding and it is likely that the proposed electrification, signaling and interim rolling stock for the CVS section could also be completed within existing funding, though the current ARRA schedules will need to be extended beyond December of 2022.

The "Stage Gate" project control process the Authority is now implementing improves project sequencing under which each step may not commence until the required prior steps have been completed. The Authority believes this process will shield future projects from the problems on existing contracts where construction began before preparation was complete.

The PRG believes that the Biden Administration will consider a request to extend the ARRA completion deadline and to re-obligate the \$929 million in FY 2010 funding. With favorable consideration, the existing federal funding may no longer be threatened as it appeared to be during the Trump Administration. Even so, there is substantial risk, given experience to date and the preliminary state of design work, that the proposed extensions to Merced and Bakersfield cannot be completed without added funding beyond that available in Proposition 1A, ARRA, FY 2010, Cap-and-Trade, and other existing financing programs.

The Authority proposes to:

- Complete the 119-mile CVS with a single-track, electrification and interim rolling stock;
- Complete all environmental documentation that is required by the ARRA commitment;
- Carry out more extensive engineering for the proposed Merced and Bakersfield links, leading to improved cost and schedule estimates for these segments; and
- Improve the engineering analysis of the costs of the future links to San Francisco and Los Angeles/ Anaheim, with particular focus on tunneling through the Pacheco Pass and the Tehachapi Mountains. This is needed because the tunnels will incur nearly half the total cost of Phase 1 and will amount to about two-thirds of the costs remaining after completion of the CVS section.

The PRG believes this is reasonable given current funding constraints. It urgently requires an agreement with the Governor and Legislature that the State will commit the funding needed to extend the CVS section to Merced and Bakersfield and to completing Phase 1 when funding becomes available. If there is no commitment to extend the system beyond the CVS section, then the Authority's plans will need to be reassessed by the Legislature.



We recognize and commend the progress that has been made, but there are critical issues that need to be addressed. Most of these are not new but they are becoming ever more important with the passage of time.

Funding. Given the range of outcomes in current construction cost estimates, the Authority may not be able to undertake the Merced and Bakersfield links without added funding, and it will definitely not be able to extend the system beyond Bakersfield and Merced without new sources of financing.

New state sources (gas tax, sales tax, vehicle tax, sugar tax, etc.) beyond Proposition 1A and Cap-and-Trade are financially feasible but may be difficult politically. The Governor has expressed support for the project but has not yet made concrete funding proposals. The value of economic development initiated by high-speed rail service will be large, but it will mostly benefit local communities and may not be a source of significant construction financing for the Authority.

New federal support may emerge given the general support for rail service expressed by President Biden and Transportation Secretary Buttigieg. The prospects for new federal programs may be clearer by mid-year, so it is speculative now to look beyond ARRA for new federal funding. In any case, a new federal program would likely require a state match. If the Authority uses Cap-and-Trade revenue to match federal contributions, the \$625 million/year (estimated average income to the Authority from Cap-and-Trade) would not reliably generate enough funding to complete Phase 1 of the program unless the matching ratio is close to Interstate Highway program levels (90/10) rather than the Federal Highway ratio (70/30) or typical FTA programs (80/20). In addition, there is presently no source of federal revenues other than general funds to support a new long-term federal program (the Interstate Highway system was funded by continuing user charges). As discussed below in our specific comments, new federal financing is also likely to include heightened focus on small and disadvantaged business opportunities that the Authority will need to address.

As discussed in earlier PRG letters, Cap-and-Trade funding is too volatile to support borrowing against future receipts, and the 2030 end to the Cap-and-Trade program limits potential receipts for the project. As in previous Business Plans, the Authority's Revised Draft 2020 Business Plan calls for actions to extend and stabilize the Cap-and-Trade program so program funds can be financed or securitized. The PRG concurs that these actions would stabilize funding for the project and would make securitization possible at a reasonable premium.

Private investment, while it may eventually be feasible, will not be available until substantial parts of the system have been in operation long enough (3-5 years) to establish the actual levels of demand and operating costs. The system will have to be built with public funding before private investment can be generated.

The PRG recognizes that finding additional funding for the project will be difficult. At the same time, we believe that some of the past management problems can be attributed to inadequate and unstable funding. Looking ahead, the project will never be fully manageable until an adequate and stable funding stream is established.

Interim operation by San Joaquin Joint Powers Authority (SJJP A) and Altamont Corridor Express (ACE) supported by CalSTA. The Authority's proposal to lease the trackage between Merced and Bakersfield for interim operations of the San Joaquin trains (with improved connections to ACE) would assure use of the new tracks until the connection with Gilroy/San Francisco is completed, but it relies on a number of assumptions:

- The Side-by-Side Peer Review Report (RSG, "Side-by-Side Peer Review Report, 2.3.2021) focuses on the question of which of the alternatives (Merced and Bakersfield links, versus HSR from Gilroy to San Francisco, versus HSR services from Burbank to Los Angeles/ Anaheim) performs best given a commitment that the entire Phase 1 system will be built eventually. It does not address whether the system should be extended if the full Phase 1 Plan is not committed.

- The Memorandum of Understanding (MOU) executed by the three parties is a comprehensive initial discussion of the expected roles and responsibilities of the three parties, but it is explicitly not a commitment of responsibilities or assured funding from any of the parties. Since the value of the proposed interim operation is heavily based on the terms of the agreement, a clear conclusion of the actual commitments is needed. The MOU does identify specific agreements that will need to be executed before service can commence. These agreements can only be executed once the state settles on a path forward for the project beyond the initial 119-mile section now under construction.
- The operating agreement proposed in the MOU would result in transferring all demand and operating cost risk to the state. If the demand and operating cost forecasts turn out to be optimistic, the state will be on the hook. This is important because the conclusions of the Side-by-Side study are described as "high-level" and subject to a wide range of variation around the predicted outcomes. The current San Joaquin services operating in the Central Valley are heavily subsidized by the state, both for operations and rolling stock procurement. The Authority's analysis indicates that its interim operating service proposal between Merced and Bakersfield could reduce the current level of state subsidy for Central Valley service. There are, however, alternative scenarios in the analysis that could lead to increased state support.
- 75% of the projected ridership on the proposed SJJPA/ ACE/Sacramento to Bakersfield link is actually not on the high-speed link but is, instead, generated on the ACE sections and on the Sacramento to Merced section on the San Joaquins as a result of shorter trip times from the connecting service to Merced and Bakersfield. This means that the viability of the proposal is critically dependent on planning, management and funding decisions by ACE, SJJPA and CalSTA that are beyond HSRA's control. On the other hand, it suggests that improving the Sacramento to Merced link might be a promising near-term opportunity that merits further examination.
- The Authority has concluded that the proposed leasing of the Merced to Bakersfield link to an operator (most likely an entity created by SJJPA and CalSTA) would not violate the strictures in Proposition I A against an operating subsidy. This is partly based on the finding in the Side-by-Side study that overall state support would decrease as a result of the improved service. The leasing proposal may be subject to legal challenge on the issue of whether it is consistent with Proposition I A.

Capital cost forecasts. As discussed above, the Authority's experience with the existing construction contracts (CP-1, CP 2-3, and CP4, as well as the SR-99 relocation) should lead to better forecasts for similar work on the proposed Merced and Bakersfield extensions, but the forecasts for electrification, signaling, rolling stock, and (especially) tunneling are more uncertain, and it is not clear that the asserted "P70" confidence level (there is a 70% probability that actual costs will be less than equal to projection) is defensible.

This raises questions for the Legislature to consider:

- Both PRG and the Authority have emphasized that many of the problems with the existing contracts have stemmed from trying to meet the time pressures that the state agreed to with FRA as a condition of ARRA funding. Driven by the deadline, the Authority started construction before adequate design and planning were completed, which resulted in significant cost (70 percent) and schedule overruns. There is no need to repeat the experience. The Authority can take the time to prove that its management is improving.
- Although the Authority is making significant progress in managing ROW acquisition, third party agreements and its construction contracts, schedule and cost problems remain. The Legislature could gain more confidence going ahead if performance on the existing contracts demonstrably continues to improve. In addition, the proposal to carry out further engineering analysis, particularly geotechnical exploration in the tunnel areas, should significantly improve the capital cost estimates of future elements.

- Much of the Authority's planning is necessarily based on the possibility that there will be new sources of financing, especially federal money. Federal plans and programs could become clearer over the next year as Covid-19 is brought under control and Congress and the Biden Administration turn to longer-term programs on infrastructure.
- In Executive Order N-79-20 (Sept 23, 2020), Governor Newsom announced that the state will need to take new measures to combat climate change, including a requirement that "the State Transportation Agency, the Department of Transportation and the California Transportation Commission, in consultation with the Department of Finance and other State agencies, shall, by July 15, 2021, identify near-term actions, and investment strategies, to improve clean transportation, sustainable freight and transit options, while continuing a 'fit-it-first' approach to our transportation system, including, where feasible, building towards an integrated, statewide rail and transit network, consistent with the California State Rail Plan, to provide seamless, affordable multimodal travel options for all ... " These actions clearly have a bearing on the state's commitment to high-speed rail as well as other transportation investment options. The Legislature should ask that the role and funding for high-speed rail receive particular attention in the July 15 report.
- The Authority, SJPA and CalSTA must focus on converting the terms of the MOU into a set of agreed commitments that will further refine the service plans, operating support and investment commitments of the parties.

The Legislature and the Newsom Administration should come together on a cautious and prudent approach to advance the work the Authority must complete to meet its federal commitments (i.e., complete the civil works and the track and systems for the 119-mile Central Valley Segment and all environmental work for the Phase 1 system) and the work necessary to further refine the cost, schedule, scope, and operating benefits of the Merced and Bakersfield extensions (i.e., advancing design work, conducting geotechnical testing, mapping right-of-way, identifying necessary third-party agreements and utility relocations, etc.). Beyond this work, and perhaps with the exception of advancing design and geotechnical work for other segments where the environmental work is completed, the Legislature want to might request the Authority to limit additional binding contractual commitments until the above questions are more thoroughly addressed, possibly in the 2023 Project Update Report required by the Legislature.

In addition to the discussion above, we have several more specific comments on the draft Business Plan and the related "2021 Proposition IA Funding Plan" that are attached below.

### **Specific comments on the Business Plan and the Funding Plan**

- The ARRA Status Reports that were developed as "Dashboards" (see [https://hsr.ca.gov/docs/about/legislative\\_affairs/arra\\_report\\_nov\\_2020.pdf](https://hsr.ca.gov/docs/about/legislative_affairs/arra_report_nov_2020.pdf)) are a valuable summary indication of project status, but could be more useful if the cost estimates were developed and reported currently with the revised schedule projections. In addition, a dashboard indicator focusing on ROW acquisition, possibly similar to the data provided in the monthly reports to the Finance Committee, would be useful.
- The Biden Administration's plans are likely to include strong measures to advance racial equity and advance access to opportunity across the American economy: i.e., workforce development and good jobs creation, small business development and growth, environmental sustainability, and mobility improvements. While there is always room for improvement, these are areas in which the Authority and the state have done considerable work and have an opportunity to excel. To that end we strongly encourage the Authority, perhaps with the assistance of the state, to undertake a Best Practices "DEI" Assessment specifically targeted at mega-program delivery and expanding the overall tool kit with respect to community benefits and importance of the multiplier effects of high-speed rail.

- We commend the Authority's new dashboard reporting on Small Business Enterprise (SBE) involvement in the program (see [https://hsr.ca.gov/small\\_business](https://hsr.ca.gov/small_business)). We strongly recommend that the dashboard be improved to show indicators for all three commitments: SBE, 30%; Disadvantaged Business Enterprises (DBE), 10%; and Disadvantaged Veterans Business Enterprises (DVBE), 3%. The current dashboard only displays performance against the SBE target where the Authority's current performance, 21 %, does not yet meet the 30% goal. Targets without reporting data are of little value.
- The analysis of Greenhouse Gas (GHG) reduction should not just be stated in metric tons of CO2 emissions avoided but should also be shown as a percent of the state total: the HSRA contribution is only a small percentage of the state's total GHG target. The potential impact of electric vehicles should also be acknowledged (shifting traffic from electric vehicles to HSRA, both using the same electricity, won't reduce CO2 emitted).
- More detail on the costs and specifications of the interim and longer-term trainsets would be helpful in assessing the proposed interim operating plan. Given that Brightline-West (Las Vegas to Victorville) proposes to buy electrified equipment with performance similar to the proposed interim sets, would a common procurement be possible?
- The Authority has asserted that single track operation would be a useful way to save money in the short term. The draft Plan does not provide sufficient information to compare the decision to delay the second track until later, and there is no information regarding the potential train schedules possible with only single-track service available.

Despite the problems, the project is gaining momentum and the options for moving ahead are emerging more clearly. Some of the critical questions, including added federal funding, may be resolved over the next year. Reports requested by the Governor should further define the Governor's vision of the potential role for high-speed rail in California. All of these add up to an opportunity for the Legislature to put the project on a sound basis that will permit better management as the project goes forward. Please let me know if you have any questions or need any further information.

Louis S. Thompson

Chairman, California High-Speed Rail Peer Review Group



cc: Hon. Lena Gonzalez, Chair, Senate Committee on Transportation  
Hon. Patricia C. Bates, Vice Chair, Senate Committee on Transportation  
Hon. Laura Friedman, Chair, Assembly Transportation Committee  
Hon. Vince Fong, Vice Chair, Assembly Transportation Committee  
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## 2020 Business Plan



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